Über dieses Buch

Dies ist ein digitales Exemplar eines Buches, das seit Generationen in den Regalen der Bibliotheken aufbewahrt wurde, bevor es von Google im Rahmen eines Projekts, mit dem die Bücher dieser Welt online verfügbar gemacht werden sollen, sorgfältig gescannt wurde.

Das Buch hat das Urheberrecht überdauert und kann nun öffentlich zugänglich gemacht werden. Ein öffentlich zugängliches Buch ist ein Buch, das niemals Urheberrechten unterlag oder bei dem die Schutzfrist des Urheberrechts abgelaufen ist. Ob ein Buch öffentlich zugänglich ist, kann von Land zu Land unterschiedlich sein. Öffentlich zugängliche Bücher sind unser Tor zur Vergangenheit und stellen ein geschichtliches, kulturelles und wissenschaftliches Vermögen dar, das häufig nur schwierig zu entdecken ist.

Gebrauchsspuren, Anmerkungen und andere Randbemerkungen, die im Originalband enthalten sind, finden sich auch in dieser Datei – eine Erinnerung an die lange Reise, die das Buch vom Verleger zu einer Bibliothek und weiter zu Ihnen hinter sich gebracht hat.

Nutzungsrichtlinien

Google ist stolz, mit Bibliotheken in partnerschaftlicher Zusammenarbeit öffentlich zugängliches Material zu digitalisieren und einer breiten Masse zugänglich zu machen. Öffentlich zugängliche Bücher gehören der Öffentlichkeit, und wir sind nur ihre Hüter. Nichtsdestotrotz ist diese Arbeit kostspielig. Um diese Ressource weiterhin zur Verfügung stellen zu können, haben wir Schritte unternommen, um den Missbrauch durch kommerzielle Parteien zu verhindern. Dazu gehören technische Einschränkungen für automatisierte Abfragen.

Wir bitten Sie um Einhaltung folgender Richtlinien:

+ *Nutzung der Dateien zu nichtkommerziellen Zwecken* Wir haben Google Buchsuche für Endanwender konzipiert und möchten, dass Sie diese Dateien nur für persönliche, nichtkommerzielle Zwecke verwenden.

+ *Keine automatisierten Abfragen* Senden Sie keine automatisierten Abfragen irgendwelcher Art an das Google-System. Wenn Sie Recherchen über maschinelle Übersetzung, optische Zeichenerkennung oder andere Bereiche durchführen, in denen der Zugang zu Text in großen Mengen nützlich ist, wenden Sie sich bitte an uns. Wir fördern die Nutzung des öffentlich zugänglichen Materials für diese Zwecke und können Ihnen unter Umständen helfen.

+ *Beibehaltung von Google-Markenelementen* Das "Wasserzeichen" von Google, das Sie in jeder Datei finden, ist wichtig zur Information über dieses Projekt und hilft den Anwendern weiteres Material über Google Buchsuche zu finden. Bitte entfernen Sie das Wasserzeichen nicht.

+ *Bewegen Sie sich innerhalb der Legalität* Unabhängig von Ihrem Verwendungszweck müssen Sie sich Ihrer Verantwortung bewusst sein, sicherzustellen, dass Ihre Nutzung legal ist. Gehen Sie nicht davon aus, dass ein Buch, das nach unserem Dafürhalten für Nutzer in den USA öffentlich zugänglich ist, auch für Nutzer in anderen Ländern öffentlich zugänglich ist. Ob ein Buch noch dem Urheberrecht unterliegt, ist von Land zu Land verschieden. Wir können keine Beratung leisten, ob eine bestimmte Nutzung eines bestimmten Buches gesetzlich zulässig ist. Gehen Sie nicht davon aus, dass das Erscheinen eines Buchs in Google Buchsuche bedeutet, dass es in jeder Form und überall auf der Welt verwendet werden kann. Eine Urheberrechtsverletzung kann schwerwiegende Folgen haben.

Über Google Buchsuche

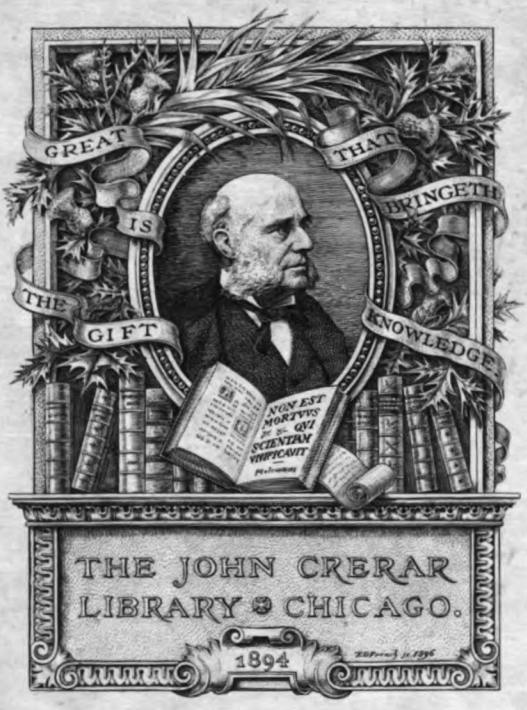
Das Ziel von Google besteht darin, die weltweiten Informationen zu organisieren und allgemein nutzbar und zugänglich zu machen. Google Buchsuche hilft Lesern dabei, die Bücher dieser Welt zu entdecken, und unterstützt Autoren und Verleger dabei, neue Zielgruppen zu erreichen. Den gesamten Buchtext können Sie im Internet unter `http://books.google.com` durchsuchen.

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

https://books.google.com

Digitized by Google


GREAT IS THE GIFT THAT BRINGETH KNOWLEDGE
NON EST MORTVVS QVI SCIENTIAM VIVIFICAVIT
THE JOHN CRERAR LIBRARY CHICAGO.
1894

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

THE
JOHN CREERAR
LIBRARY

THE

RAILWAY MAGAZINE

VOL. XLIII.

JULY TO DECEMBER.

1918.

LONDON:
30, FETTER LANE, FLEET STREET, E.C. 4.

Digitized by Google

THE
JOHN CRERAR
LIBRARY

LONDON:
HARRISON AND SONS,
44-47, ST. MARTIN'S LANE, W.C. 2.

Digitized by Google

INDEX TO VOL. XLIII.

Articles.

		PAGE
Agricultural Transport in the Future: Narrow-gauge and Light Railway Development in Britain	*Basil Mercer*	317
Automatic Continuous Brakes on Railways		357
Barry Railway: Its Growth and Enterprise		38
Brecon and Merthyr Railway: Its History and Locomotives	*H. L. Hopwood*	73
British Locomotive Practice and Performance	*Cecil J. Allen*	17, 109, 163, 215, 303, 380
Cambridge, Great Northern Route to	*H. L. Hopwood*	1
Carriage Paid Goods Traffic		129
Croydon and Oxted Joint Railway	*H. L. Hopwood*	237
Engine Head Signals, Revised		195
Freight Train Operating, The Principles of	*Denis O'Donoghue*	325
French and Belgian Railway Tickets, Some	*P. C. L.*	403
Great Central Railway: New 2 8-0 Type Locomotive		91
Great Eastern Railway: Milk Traffic on the Ongar Branch		292
Great Northern Railway: New 3-Cylinder Coal Engine		43
Great Northern Railway: Finish of a Famous Class of Engines		370
Great Southern & Western Railway: Rebuilt Locomotive, Class 321		411
Government Control of Railways in War Time: No. 1. The United States of America	*Vernon Summerfield*	35
No. 2. England and France	*Vernon Summerfield*	105
Highest Mountain Railway: Manitou and Pike's Peak Line, U.S.A.	*R. W. A. Salter*	121
Locomotive and Train Working the latter part of the 19th Century: Great Eastern Railway	*E. L. Ahrons*	9, 86, 151 241, 295, 364
Locomotive Design, Some Points connected with		263
London and North Western Railway: An Historic Locomotive, *The Cornwall*		143
London, Brighton and South Coast Railway: Early History	*H. H. Meik*	92, 175
Literature of the Iron Road, The	*Basil Mercer*	247
Mawddwy Railway	*T. R. Perkins*	375
Midland (L.T. & S. Section) of To-Day	*J. F. Gairns*	255
Military Trains in India		265
Newport Docks: The Great South Wales Coal & General Merchandise Port		184
North Eastern Railway: Famous Mid-Victorian Locomotive, *The Aerolite*		287
Owners' Risk Note	*Charles Dix*	191
Railway Accountancy: Some Suggested Reforms	*John Orr*	331
Railway Race, A Wonderful	*John Orr*	30
Re-inforced Concrete, Railway Uses for		98
Some West Country Gradients: The South Devon Banks	*W. J. Scott*	157
Switzerland, East to West	*Edwin J. Miller*	392
United States Ambulance Trains: No. 64, Built by London and South Western Railway		41
No. 65, Built by London and North Western Railway		51

Locomotives.

Alsace-Lorraine	286
American	70, 334
Australian	198
Brecon and Merthyr	79, 80, 81, 82, 83, 84
Caledonian	139
Cambrian	353
French	206
Great Central	24, 54, 60, 90, 91, 172, 224, 263, 304
Great Eastern	9, 10, 11, 12, 13, 14, 87, 88, 89, 151, 152, 153, 154, 155, 242, 243, 244, 245, 296, 297, 298, 299, 303, 364
Great Northern	6, 7, 43, 44, 108, 118, 140, 28[illegible], 291, 370, 371
Great Northern (Ireland)	29, 202, 236
Great Southern and Western	173, 411
Great Western	116, 215, 264, 307, 355
Highland	254
Indian	414
Internal Combustion	402
Italian	285
Jersey Eastern Railway	163
Lancashire and Yorkshire	62, 119, 262, 310
London and North Western	68, 69, 140, 142, 143, 144, 145, 146, 147, 148, 149, 150, 207, 211, 212, 213, 312
London and South Western	141, 324
Midland	136, 255, 258, 274, 315, 347
Midland Great Western	204, 284, 345
Midland and South-Western Junction	26
North British	63, 294
North Eastern	117, 287, 288, 289, 290
North Staffordshire	59, 67, 112
Somerset and Dorset Joint	109
South-Eastern and Chatham	313

336551

656.052

Digitized by Google

Miscellaneous.

	PAGE
Australian New 2-8-0 Type Locomotive	196
Baldwin Meter-Gauge Locomotive: Morvi Railway, India	414
Children's Day at Wembley, London and North-Western Railway	52
Electric Shunting Locomotive, Lancashire and Yorkshire Railway	262
Flag Day, Railway Men's	34
Great Northern Railway (Ireland): New Side Corridor Carriages	413
Highland Railway: New 4-6-0 Type Locomotive, No. 73	254
Internal Combustion Engine	402
King's Birthday Honour for London and North-Western Railway General Manager	35
Narrow-gauge Railway Scene: Ravenglass and Eskdale Railway	333
Napier Motor Lorry in War Service	8
New Mallet Locomotive: Norfolk and Western Railroad	334
North British Railway Directors' Cab at Waverley	294
Scene on the Siberian Railway	339
Shunting by Signs at Nine Elms	343
Sligo, Leitrim and Northern Counties Railway New General Manager	240
Taking Water at Hitchin	291
Tank on Tour, A	16
Victorian Railways: New Cars for Special and Excursion Traffic	199

Pertinent Paragraphs

53, 131, 204, 275, 340, 416

Plates.

Caledonian Railway: New 0-6-0 Type Goods Engine, No. 300	*Facing* 287
Great Central Railway: 2-8-0 Engine, No. 412	73
Great Western Railway: 2-6-0 Engine, No. 4331	1
London and North-Western Railway: The "Cornwall" Locomotive	143
North Eastern Railway: Luncheon Car Express	215
Railway Magazine Air Brake Chart	357

Railway Literature

201, 272

Railway Portrait Gallery.

Mr. Cecil J. Allen, Great Eastern Railway	216
Mr. Alfred Aslett, J.P., formerly Secretary and General Manager, Furness Railway	135
Sir John A. F. Aspinall, General Manager, Lancashire and Yorkshire Railway	420
Sir James Benjamin Ball, Engineer-in-Chief, London, Brighton and South Coast Railway	66
Mr. A. Brook, Divisional Superintendent, Worcester, Great Western Railway	422
Sir George Bury, Vice President, Canadian Pacific Railway	352
Mr C. R. Byrom, Assistant Superintendent of the Line, London and North Western Railway	210
Sir Guy Calthrop, Bart., Controller of Coal Mines (General Manager, London and North Western Railway)	33
Mr. J. Carter, Divisional Superintendent, Swansea, Great Western Railway	421
Mr. John Cathles, Secretary, North British Railway, 1892-1918	208
Major Charles L. Conacher, O.B.E.	349
Late Mr. Peter Drummond, Locomotive Superintendent, Glasgow and South Western Railway	178
Mr. R. Duckworth, M.B.E., Police Superintendent, London and South-Western Railway	372
Mr. John Ellis, District Traffic Superintendent, Glasgow, North British Railway	423
Mr. E. Ford, Assistant Goods Manager, Great Western Railway	421
Mr. C. F. Graseman, London and North Western Railway	52
Lord Inchcape, G.C.M.G., K.C.S.I., Director, Great Western Railway	209
Mr. S. Little, General Manager, Sligo, Leitrim and Northern Counties Railway	240
Late Mr. William C. May, Chief Traffic Manager, Great Eastern Railway	348
Captain Gerald McDermott, A.S.C., M.C.	67
Mr. James McLaren, Secretary, North British Railway	282
Mr. Herbert Rhys Price, General Manager, Brecon and Merthyr Tydfil Junction Railway	75
Late Mr Henry J. Pryce, M.Inst.C.E.	283
Mr. H. J. Prytherch, Great Eastern Railway	64
Late Mr. John Rees, J.P., Swansea Divisional Superintendent, Great Western Railway	210
Lord Shaughnessy, President, Canadian Pacific Railway	351
Mr. M. S. Strang, Commercial Superintendent, North British Railway	422
Late Mr. W. M. Turnbull, Assistant Superintendent of the Line, London and North Western Railway	65
Late Mr. Robert Wild, Works Manager, Great Western Railway (Ireland) Works, Dundalk	350
Mr. I. T. Williams, Acting General Manager, London and North Western Railway	52

The Why and the Wherefore

46, 124, 188, 269, 335, 405

What the Railways are Doing

64, 138, 208, 282, 348, 420

Digitized by Google

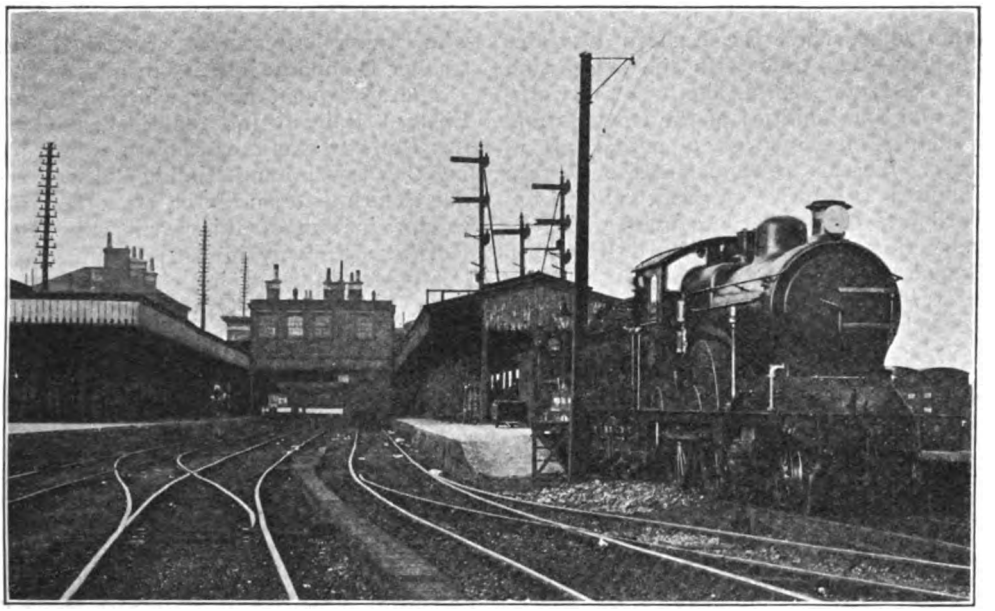
Digitized by Google

THE RAILWAY MAGAZINE.

GREAT WESTERN RAILWAY 2-6-0 Engine No. 4331.

Designed by Mr. G. J. Churchward, Chief Mechanical Engineer.
Cylinders: 18½ in. diameter by 30 in. stroke. Driving wheels: 5 ft. 8 in. diameter.
Heating surface: Tubes, 1,349·64 sq. ft.; firebox, 128·72 sq. ft. Superheater, 212·58 sq. ft. Total, 1,690·94 sq. ft.
Grate area: 20·56 sq. ft. Working pressure: 200 lbs. per sq. in. Tractive effort at 90% = 27,180 lbs.
Water capacity: 3,500 gallons. Weight of engine in working order: 62 tons. Weight of tender in working order: 40 tons.

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

UP END OF CAMBRIDGE STATION.

The view shows the bay used by Great Northern Railway trains on the left side, and by London and North Western Railway trains on the right side.

The Great Northern Route to Cambridge.

By H. L. HOPWOOD.

ALTHOUGH Cambridge is situated on railway territory which is foreign to the Great Northern Railway, that Company has important interests in the University town, and for a very long time has held a strong position there. Its present "occupation" commenced April 1st, 1866, but in order to show how the Great Northern Railway reached Cambridge it is necessary to go back some years prior to that date, and to relate particulars of a small undertaking known as the Royston and Hitchin Railway.

By Act of 1846 this Company was empowered to make a railway from Royston to join the Great Northern main line at Hitchin (12¾ miles), and two years later, with the object of reaching Cambridge, it obtained a further Act for a 5 miles extension from Royston to a junction at Shepreth with a proposed Cambridge and Bedford branch of the Eastern Counties Railway. The line was opened from Hitchin to Royston, October 21st, 1850, and from Royston to Shepreth, August 1st, 1851, and was worked by the Great Northern Railway, who guaranteed a 6 per cent. dividend to Royston and Hitchin shareholders.

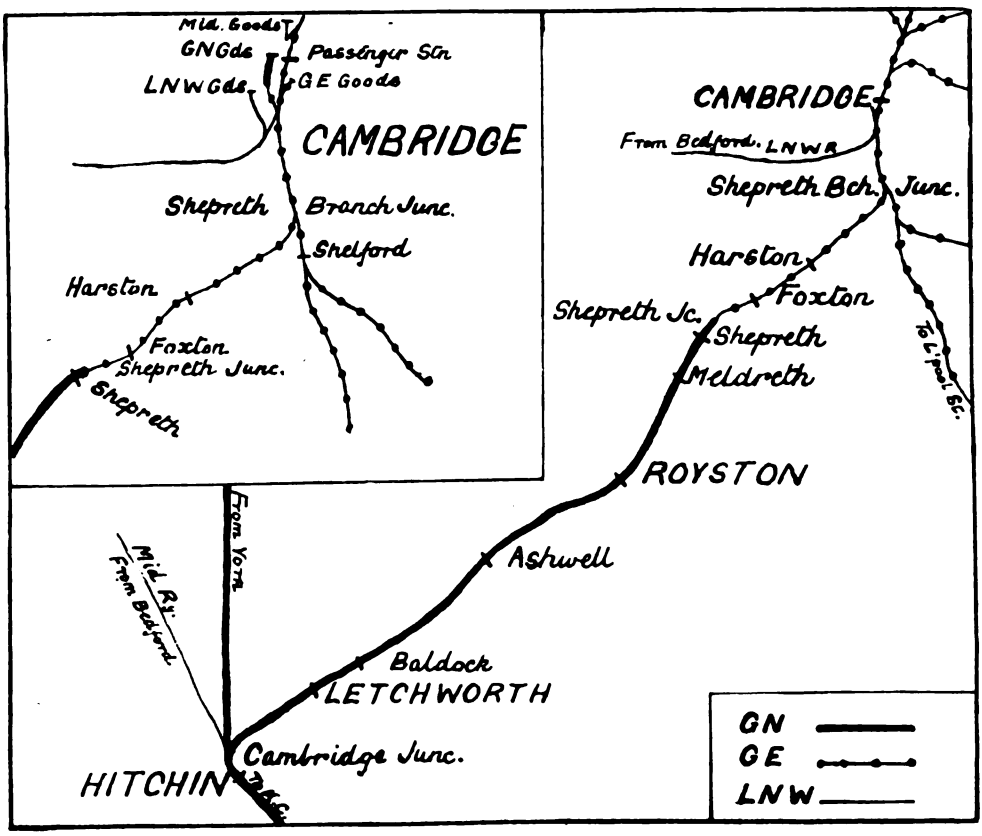
Thus, in 1851, Great Northern trains had approached to within 8 miles of Cambridge, and for obvious reasons the Company was not satisfied until it had obtained access to that town, either by means of running powers or over its own metals. On the other hand, it was equally obvious that the Eastern Counties Railway, who owned Cambridge station and a route of its own from London, desired no second Company to share its monopoly of the London-Cambridge traffic, and so refused the Great Northern's application for running powers into the station. In these circumstances, the Great Northern Company promoted a line of its own from Shepreth to Cambridge, but the Bill was thrown out in the session of 1851. Thereupon, the King's Cross authorities

Digitized by Google

again approached the Eastern Counties Railway—this time with the suggestion that the latter should take over the working and the liabilities of the Royston and Hitchin Company for a period of 14 years. To this arrangement the Eastern Counties Railway agreed, and from April 1st, 1852—the date upon which its connecting line from Shelford (Shepreth Branch Junction) to Shepreth was ready for traffic—Eastern Counties trains commenced running between Cambridge and Hitchin. At first there were three trains each way daily, but the number was afterwards increased to four.

Though not concerning the present subject, it may be mentioned as an incident that the Cambridge and Bedford Branch was never made by the Eastern Counties Railway, but by an independent Company, the line being opened August 1st, 1862. It was worked by the London and North-Western Railway, who soon afterwards absorbed the smaller Company into its own system.

The agreement under which the Great Eastern Railway (as the Eastern Counties Railway was now known) was working the Royston and Hitchin Railway was due to terminate on March 31st, 1866, and in anticipation of this event, the Great Northern Railway in 1864 again applied for powers for an independent railway from Shepreth to Cambridge. The Bill was, however, withdrawn, on the understanding that the Great Eastern Railway would double its single line between Shepreth Branch Junction and Shepreth and give the Great Northern Railway running powers to Cambridge. But when, on April 1st, 1866, the working of the Royston and Hitchin line reverted to the Great Northern Railway, it was found that the Great Eastern section was not doubled, neither was there proper accommodation at Cambridge Station.



MAP OF CAMBRIDGE BRANCH, GREAT NORTHERN RAILWAY.

Digitized by Google

Briefly told, that is the story of how the Great Northern Railway reached Cambridge; and, by maintaining a fast and punctual passenger train service and providing its own equipment for goods had doubled the line to Shepreth, and in July the Great Northern Railway put an accelerated service into force. The following was the timing of its Cambridge expresses at that date :—

JULY, 1867.

Down.		a.m.	Speed, m.p.h.	Noon.	Speed, m.p.h.	p.m.	Speed, m.p.h.
Distance.							
M. ch.	King's Cross ... ...dep.	9.0	—	12.0	—	5 0	—
31.74	Hitchin ... ... arr.	9A48	39.9	12A48	39.9	5A40	47.9
—	„ ... ...dep.	9.50	—	12.50	—	5.52	—
36.47	Baldock ... ...dep	—	—	—	—	6.2	31.0
44.72	Royston ... ... arr.	10.9	40.9	1.9	40.9	6.16	35.6
—	„ ... .dep.	10.10	—	1.10	—	6.17	—
57.75	Cambridge ... ... arr.	10.30	39.1	1.30	39.1	6.38	37.2

A.—By slip coach.

Up.		a.m.	Speed, m.p.h.	p.m.	Speed m.p.h.
Distance.					
M. ch.	Cambridge ... ...dep.	10.5	—	3.50	—
13.3	Royston ... ... arr.	10.30	31.3	4.13	34.0
—	„ ... ...dep.	10.31	—	4.15	—
21.28	Baldock ... ...dep.	10.45	38.3	—	—
26.1	Hitchin ... ... arr.	10.55	27.9	4.40	31.1
—	„ ... . dep.	11.2	—	4.45	—
57.75	King's Cross ... ... arr.	11.45	44.5	5.35	38.3

traffic, it has for more than 50 years enjoyed a good share of the town's traffic. It was not to be expected that, in regard to frequency of fast trains, the Great Northern could compete on equal terms with the Great Eastern, whose main line passed through Cambridge, but so far as actual speed (excluding stops) was concerned, the fastest Great Northern trains were generally equal to, if not better than, those provided by the competing Company. All King's Cross-Cambridge expresses stop at Hitchin, and many of them at Hatfield and Royston also, and they travel by a route which is 2¼ miles longer than that from Liverpool Street.

In 1866 the Cambridge Branch was served by seven trains each way, two of which—the 9.0 a.m. and 12.0 noon from King's Cross (9.52 and 12.52 p.m. from Hitchin)—were fast, running the 26 miles to Cambridge in 48 minutes, with stops at Royston and Shepreth. There were no fast up-trains, but three of them missed a few intermediate stations. By June, 1867, the Great Eastern Railway

In the case of the down trains, all three had Cambridge coaches slipped from main line trains at Hitchin, and the 9.0 a.m. and 12.0 noon provided a 90 min. service, which was equal to the best contemporary Great Eastern performance—that of the 5.0 p.m. from Bishopsgate, due Cambridge at 6.30 p.m. The Great Eastern route was then via Stratford, and measured 58 miles, the same as that from King's Cross, but the opening of the line via Hackney Downs in 1872 reduced the Great Eastern distance to 55¾ miles, at which figure it still remains. Owing to adverse gradients, Great Northern trains on the up-journey were not so fast, the quickest occupying 100 min., whereas one Great Eastern up morning train ran to Bishopsgate in 90 min.

In the summer of 1876 the Great Eastern Railway accelerated to 78 min. the 12.3 p.m. non-stop train ex St. Pancras. This train (and others) ran via the Tottenham and Hampstead Junction Railway and reached the Great Eastern line at Tottenham Hale. The distance

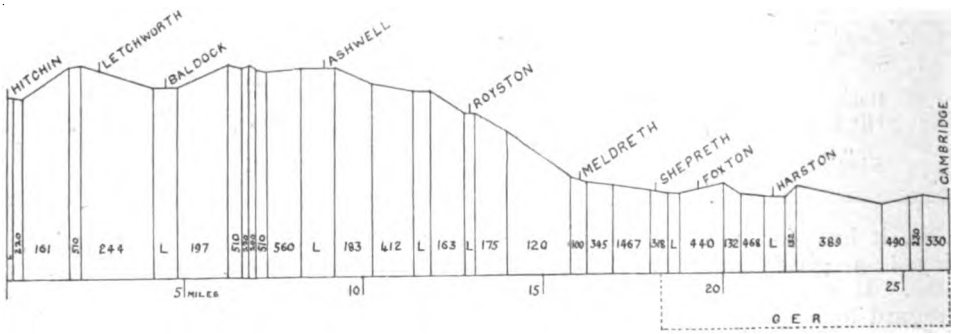
Digitized by Google

to Cambridge by this alternative route is 56½ miles. At that date (1876) the 5.0 p.m. ex King's Cross was the fastest Great Northern train, which, with a 5 min. stop at Hitchin (5.45 to 5.50), was due Cambridge at 6.25 p.m. (speed 43.5 m.p.h.), or 7 min. slower than the 12.3 p.m. from St. Pancras. The Royston stop was deleted and the train ran from Hitchin to Cambridge in 35 min.

There were one or two curious features connected with some of the up trains about that time. For instance, the 8.40 a.m. ex Cambridge was divided on reaching King's Cross, and some of the coaches went through to Moorgate. The slipping of coaches at unusual places was much resorted to. The 10.0 a.m. from Cambridge slipped at Royston, and the 2.0 p.m. at Royston on Wednesdays and at Hatfield each day. "Slipping" is now obsolete on the Great Northern Railway, but 40 or 50 years ago probably no Company indulged more in this practice than did the Great Northern, such comparatively unimportant stations as Barnet and Potters Bar being served by slip coaches from express trains.

During the '80's and '90's, and, in fact, until June, 1904, the 5.0 p.m. from King's Cross was due Cambridge at 6.17, 8 min. better than in 1876; and it was not until July, 1904, that it was further quickened to reach its destination at 6.15. Thus, in the summer of 1904, Cambridge was for the first time brought within 75 min. of King's Cross. There was then no stop at Royston, but one was inserted later, without, however, adding any time to the journey. This increased the running speed of the train to 48.3 m.p.h., which compared with 47.7 m.p.h. by the contemporary Great Eastern 71 min. non-stop run of the 12.20 p.m. from St. Pancras. The 5.0 p.m. from King's Cross retained its 75 min. booking until the end of April, 1918.

In July, 1914, there were five down (six on Saturdays) and six up trains timed to do the journey between King's Cross and Cambridge in 90 min. or less. We have already indicated the 5.0 p.m. as being the quickest, and it was the only 75 min. train. The 3.0 p.m. was 4 min. slower, and, making a non-stop run from Hitchin to Cambridge in 32 min., was due at the latter station at 4.19. The 11.10 a.m. from King's Cross was an 80 min. train, and called at Hatfield and Hitchin, and then ran through to Cambridge, doing the last 26 miles in 33 min. The 7.30 p.m. was due Cambridge at 8.52 (82 min.), and had stops at Hatfield, Hitchin, and Letchworth. The 12.40 p.m. was a Saturdays only train, and, stopping at Knebworth, Stevenage, Hitchin, Letchworth and Royston, was due Cambridge at 2.7 p.m. (87 min.). The 9.0 a.m., a 90 min. train, can be regarded only as a semi-fast, as it stopped at Finsbury Park, Knebworth, Hitchin, Letchworth, Baldock and Royston.



GRADIENT DIAGRAM, CAMBRIDGE BRANCH, GREAT NORTHERN RAILWAY.

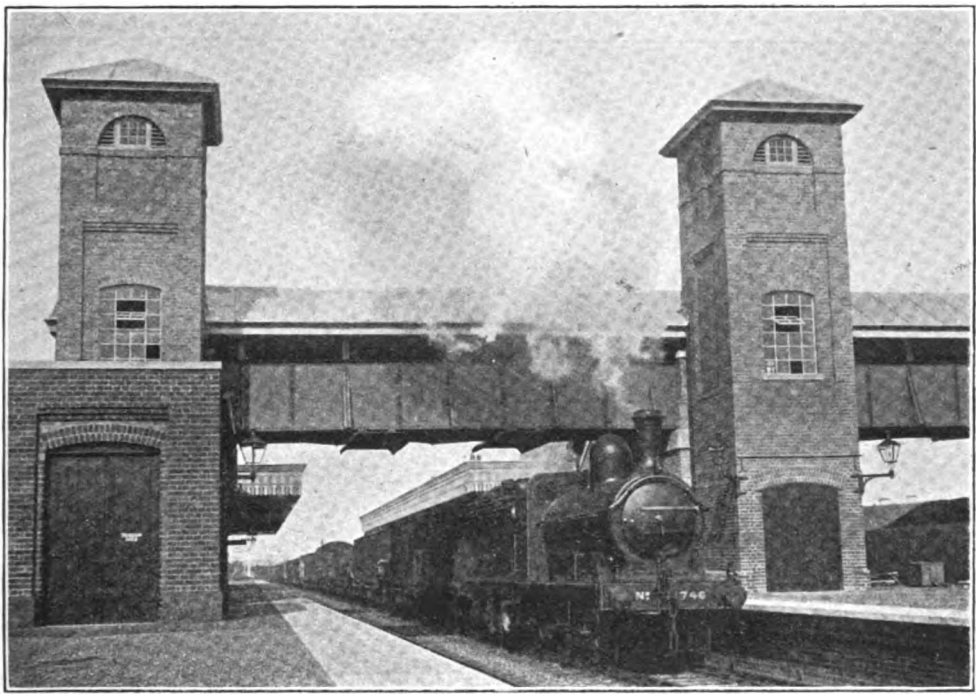
It is curious to note that the 9.0 a.m. and 5.0 p.m. trains of July, 1867, still survived in the time-tables of July, 1914. But whereas the 5.0 p.m. was 23 min. faster in 1914 than in 1867, the 9.0 a.m. retained its Cambridge arrival time of 10.30 during the interim, though in the later period it had six intermediate stops as against two in 1867.

The best up trains took 80 min., or 5 min. longer than the best down, but

Digitized by Google

this was due to steeper gradients met with on the up journey. There is an almost unbroken ascent for 17 miles from Cambridge to Ashwell, including nearly 4 miles at 1 in 100, 120, 175, and 163 from Meldreth to past Royston, as an examination of the gradient profile on page 4 will show.

There were four trains that ran from Cambridge to King's Cross in 80 min. —the 8.30, 10.0, 11.55 a.m., and 4.35 p.m. Excluding stops, three of them occupied 74 min., which meant a running speed of 47 m.p.h.; whilst the



Photo] [*H. L. Hopwood.*

GREAT NORTHERN RAILWAY.

Coal train passing Letchworth. 0-6-0 locomotive, No. 746.

11.55 a.m. ran up in 76 min. net (speed 45.7 m.p.h.). This was the only train that ran from Hitchin to King's Cross without a stop (time 39 min.); the 8.30, 10.0 a.m., and 4.35 p.m. calling at Finsbury Park, and the 2.15 and 6.30 p.m. at Hatfield as well as at Finsbury Park. All up trains stopped at Royston except the 2.15 p.m. from Cambridge, and even this train called on Wednesdays.

It has been the rule to employ locomotives of only secondary power on the Cambridge services, and such engines have always been noted for the excellent work they have performed. Although the trains are not particularly heavy, stops are frequent, and in normal practice this involves very fast running between stations. The bulk of the traffic is worked by 2-4-0 and 4-4-0 6 ft. 7 in. coupled engines, and it is only occasionally that the 4-4-2 type makes its appearance on the branch.

As a comparison with the Great Northern services, it will be of interest to give brief particulars of Great Eastern trains between London and Cambridge in July, 1914. At that date trains between Liverpool Street or St. Pancras and Cambridge, occupying 90 min. or less, numbered 12 down and 13 up. The fastest train was the 12.20 p.m. from St. Pancras, due Cambridge at 1.31, thus making the non-stop run of 56½ miles in 71 min. (speed 47.7 m.p.h.). The best, and only, non-stop train from Liverpool Street was the 5.5 p.m. (74 min.—speed 45.1 m.p.h.). All other trains stopped

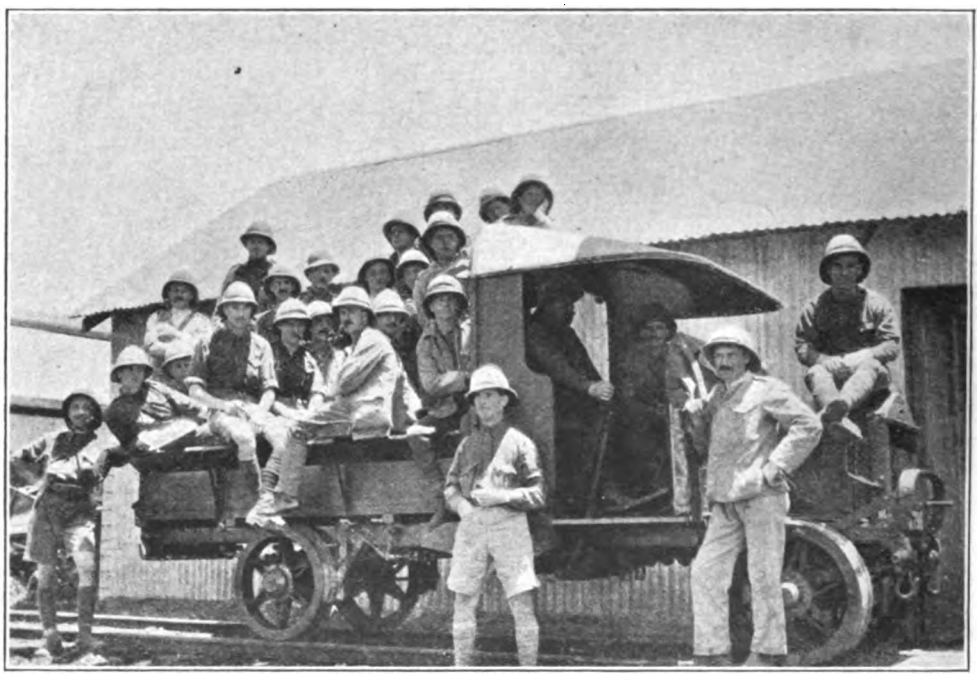
Digitized by Google

Napier Motor Lorry in War Service.

BY the courtesy of Mr. H. T. Vane, Managing Director of Messrs. D. Napier and Son, Ltd., manufacturers of Napier motors, 14, New Burlington Street, London, W., the RAILWAY MAGAZINE is able to illustrate one of the commercial motor vehicles of Napier manufacture, which, like many others of its kind, has been converted to rail traction for military service.

At the time the photograph was taken it was conveying a unit of 27 men from a certain point to the front, and it is certainly noteworthy that a motor lorry of moderate power should be able to transport such a body of men with ease and speed to any desired point on the railway system. In addition to carrying passengers, the lorry also draws three or four railway trucks with stores.

In connection with the use of this vehicle in the circumstances related, the following extract from a communication received by D. Napier and Sons, Ltd., is worthy of record. The writer of the letter remarks: "I was sent out from England with a convoy of Napier lorries, and should like to say that these lorries have done splendid work both as converted railway cars and road cars. The first six months of wear over the roughest country showed that not one bearing gave out, and all through I had no trouble at all with them." The performance of the vehicle as reflected by the above quotation may be said to pay a convincing tribute to British workmanship.



NAPIER LORRY CONVERTED TO RAIL TRACTION FOR MILITARY SERVICE.

In the "Railway Year Book, 1918," attention is directed to the yeoman service rendered by Napier motor lorries in war service. Thus, when the British took possession of "German" East Africa, they were for some time in occupation of the Central Railway, but without locomotives to work it. The difficulty was surmounted by adapting Napier 30-cwt. lorries. Fitted with flanged wheels they were used on the ordinary railway, and did much useful service.

Digitized by Google

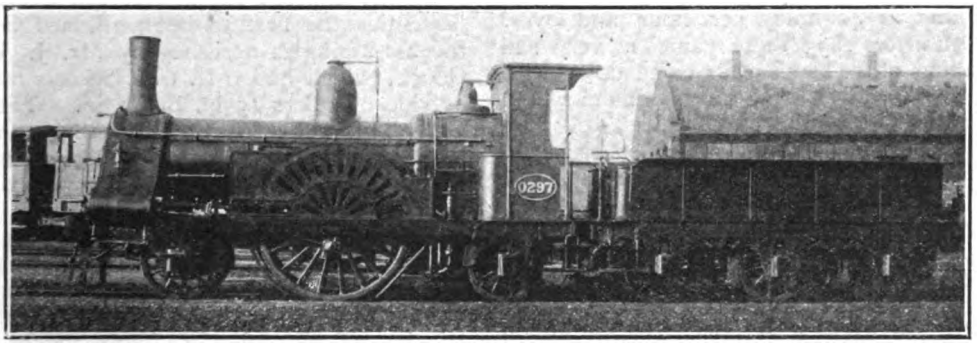
Locomotive and Train Working in the latter part of the 19th Century.

GREAT EASTERN RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN writing on the subject of the Great Eastern Railway, I must at once admit that, although I had a considerable knowledge of nearly all the engines, my first-hand experience of their working and the districts in which they ran was not so intimate or detailed as that of the railways with which I have hitherto been dealing, for the reason that my Great Eastern travellings were fewer and not so frequent. The gaps in my own personal knowledge of the working have, however, been very kindly filled in for me by a friend who was for a long number of years in the locomotive department of that railway, and this help, together with many of my own notes, has enabled me to add the doings of this railway to this series of articles.

In the late 'seventies there were two main lines from London, both of which terminated, as far as express work was concerned, at Norwich. Probably the more important expresses took the Cambridge route, and travelled via Ely and Thetford. Yarmouth and Lowestoft seemed at that time to be the principal objectives on the coast route. The joint line from March to Lincoln was not then in existence, and was opened only in 1882. The portion of the joint line from Lincoln to Black Carr Junction, near Doncaster, had existed for many years as Great Northern property, and after the opening of the new joint line to Lincoln was transferred to the ownership of the Joint Committee.



Photo] [*Locomotive Publishing Co., Ltd.*

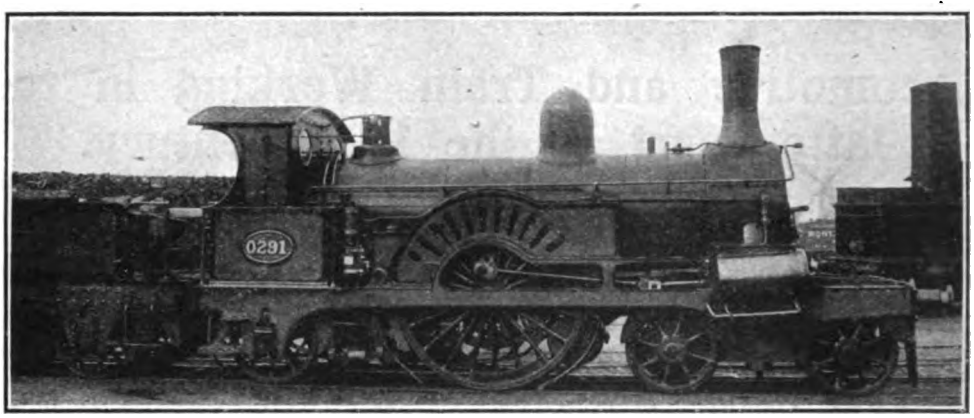
SINCLAIR TYPE SINGLE EXPRESS ENGINE, NO. 0297.

Built by Kitson and Co., 1864. Wheels, 7 ft. 1 in. Cylinders, 16 in. by 24 in.

In regard to maximum speeds for expresses, the Great Eastern went through some strange and perplexing vicissitudes. In 1878 the speeds of the best trains were considerably below those of 1850 to 1855. At this early period the Great Eastern (then the Eastern Counties Railway) ran some of the fastest trains in the country, coming behind only the Great Western and the Great Northern. The following gives some of the best Great Eastern runs of that early date:—

	Miles	Min.	Speed m.p.h.
Stratford to Cambridge ...	54	75	43.6
Cambridge to Ely	14¾	20	42.2
Ely to Wymondham... ...	44	55	48
Norwich to Ely...	53¾	70	46.1

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

SINCLAIR TYPE SINGLE EXPRESS ENGINE, NO. 0291.

Rebuilt with leading bogie, driving wheels 7 ft. 3 in. Cylinders, 17 in. by 24 in.

The last two runs were certainly astonishing for the period, when only the two other railways above mentioned ran trains at 40 miles per hour and over. But after 1855 there came a very sad falling off. The speeds came down with a rush, until in 1857 the maximum was a modest 37 m.p.h.

Of the 1850-5 performances the best were usually made by the 6 ft. and 6 ft. 6 in. singles with outside cylinders and rear driving wheels, built in 1846-7 by Messrs. Jones and Potts and R. Stephenson and Co. The old 4 p.m. down from Bishopsgate, one of the best of these early expresses, worked by an old Jones and Potts single No. 44, had 69.2 m.p.h. to its credit between Tottenham and Ponders End, and another of the class attained a maximum of 70.5 near Waltham on an up express. Very nearly the same maximum speeds were regularly attained near Ponders End by the 6 ft. 6 in. rear driver singles Nos. 98 to 102, with loads of seven to nine four-wheeled coaches on the 5 p.m. down express. It is extremely probable that the old four-wheeled coaches rocked about a good deal during these performances. Coming now to 1878, amongst the best, and I believe actually the fastest, runs were :—

	Miles.	Min.	Speed m p.h.
Norwich to Ely	53¾	80	40.3
Ely to Norwich	53¾	78	41.3
St. Pancras to Cambridge.	56¼	78	43 3

In January, 1880, there was no Great Eastern express booked at an average speed of 45 miles per hour.

Of the express engines of the middle 'seventies the first to be mentioned are the 2-2-2 singles designed by Mr. J. V. Gooch, which had 6 ft. 6 in. wheels and outside cylinders 15 in. by 22 in. They were built between 1855 and 1859, and lasted until the period 1875 to 1879, after putting in some 20 years' service with the original boilers.

A timing of one of these engines on a Cambridge-London express in 1860 may be of interest to compare with modern runs. The engine was No. 94 (Stratford Works, 1857) and the load 10 four-wheeled coaches :—

Miles.			Approximate speed, m.p.h.
—	Cambridge ... ... dep.	9.22	—
3¼	Sh·lford... ... ...pass.	9.30	24.4
6½	Whittlesford .. .. „	9.36	32.5
10	Great Chesterford.. „	9.41	42.0
14	Audley End ... ... „	9.48	34.3
15¾	Newport ... ... „	9.50½	42.0
20	Elsenham ... ... „	9.57	39.2
22¼	Stanstead ... ... „	10.0	45.0
25	Bishop's Stortford. arr.	10.5	36.0
—	„ „ dep.	10 8	—
29	Sawbridgeworth .. pass.	10.16	28.1
31¼	Harlow ... ... „	10.18¾	49.1
32¾	Burnt Mill ... ... „	10.20½	51.4
35½	Royden ... ... „	10.23¼	50.8
38½	Broxbourne .. ... „	10.28	42.4
41½	Cheshunt ... ... „	10 32	45.0
42¾	Waltham ... ... „	10.33 7/2	47.4
45¾	Ponders End... ... „	10.37	52 7
48	Angel Road ... ... „	10.39 7/2	52.2
48¾	Park ... . „	10.40½	49.1
49¼	Tottenham ... ... „	10 41 3/4	51.4
51¾	Lea Bridge ... ... „	10.44¼	46.4
54	Stratford .. ... arr.	10 47¾	38.6

Digitized by Google

The 29 miles from Bishops Stortford to Stratford were run in 39¾ minutes, at an average speed of 44.1 m.p.h., not such a bad performance for a very light and small single engine.

But the most celebrated of the Great Eastern express engines, which bore the whole burden of the main line fast trains for a long number of years, were the 7 ft. singles with outside cylinders 16 in. by 24 in., designed by Mr. Sinclair, and built in 1862 to 1867. And of these, amongst the best of them were six constructed by the celebrated French firm, Messieurs Schneider et Cie, of Creusot, of 75 m.m. gun fame. Once equipped with the 30 engines of this class (there had originally been 31, but one of them was destroyed in the disastrous collision near Thorpe in 1874), the Great Eastern rested on its oars for many years, for only two real express engines were put into service between 1867 and 1879. The Sinclair "singles" were as follows :—

Original Nos.	Renumbered 1879-80.	Built by	Date.
51—53	275—277	Avonside Engine Co., Bristol	1864
54	—	Do.	*"
55—60	278—283	Do.	"
284—288	—	W. Fairbairn & Sons, Manchester	1862
289—298	—	Kitson & Co., Leeds...	1865
299—300	—	Schneider and Cie., Creusôt	1866
87	301	Do.	†1867
88—90	302—304	Do.	1866

* Destroyed in collision, 1874.
† Exhibited at Paris in 1867.

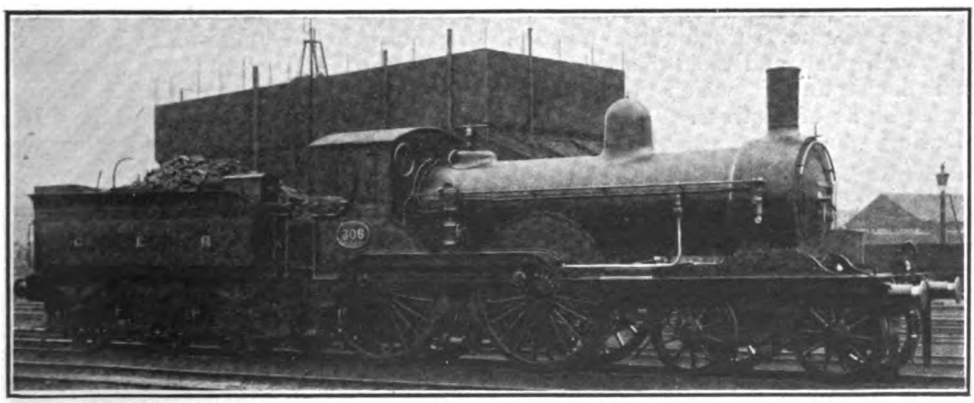
The total wheelbase was somewhat short, being only 15 ft., but, nevertheless, they were much steadier riding engines than many contemporaneous outside cylinder single engines belonging to other railways. The heating surface of the original boilers, which carried only 120 lb. pressure, was 1,051 sq. ft. The tenders of most of them had wooden frames with hornplates bolted on, but the Frenchmen all had iron-framed tenders. The engines weighed only 29¼ tons in working order, of which rather over 11¼ tons were carried on the driving wheels. When the engines were rebuilt their weight was increased to 33½ to 34 tons, of which 13½ tons were on the drivers. The boiler pressure then became 140 lb., and the driving wheels were increased to 7 ft. 3 in. diameter.

During the greater part of the "'seventies" until the larger Bromley singles came out in 1879 the Sinclairs were distributed as follows :—

Stratford.—57, 87, 289 to 295, 297, and 298.
Cambridge.—88, 89, 90, 284, 296, and 299.
Norwich.—53 (54), 55, 59, 60, 285, 286, 287, and 288.
Ipswich.—51, 52, 56, 58, and 300.

Nos. 51, 291, and 60 were rebuilt by Mr. S. W. Johnson, and painted yellow, somewhat after the L.B. and S.C. practice, and the two first mentioned had leading bogies added to them. The cylinders were enlarged to 17 in. diam.

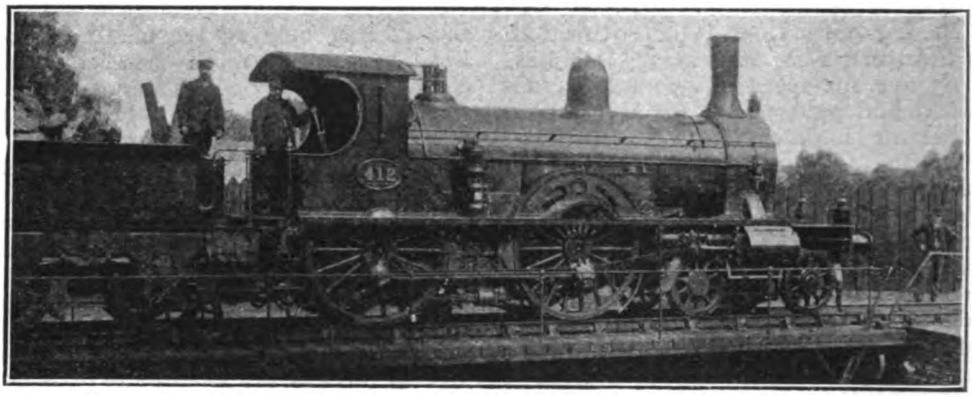
The Stratford engines worked to Norwich, both via Ipswich and via Cambridge; and, similarly, Norwich engines ran through to London. But it was



Photo] [*Locomotive Publishing Co., Ltd.*

NO. 306, ONE OF THE TWO 4-4-0 EXPRESS ENGINES NOS. 305 AND 306, DESIGNED BY MR. S. W. JOHNSON.
Built at Stratford, 1874. Rebuilt by Mr. Holden, 1888. Wheels, 6 ft. 7 in. Cylinders, 17 in. by 24 in.

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

NO. 412, ONE OF THE TWENTY 4-4-0 FAST PASSENGER ENGINES REBUILT BY MR. ADAMS, WITH LEADING BOGIES FROM 2-4-0 EXPRESS GOODS ENGINES.
Wheels, 6 ft. 3 in. Cylinders, 17 in. by 24 in.

more usual for trains over the Cambridge route to change engines either at that place or at Ely. The French single of Paris (1867) Exhibition fame was retained for a long time on the Continental boat expresses to Harwich.

In the early 'eighties the Sinclair singles migrated for the most part to the country, but, nevertheless, were employed on many of the main line expresses, though the heaviest of these trains were handed over to the Bromley "singles" of 1879-1882. Some of the Stratford "Sinclairs" were transferred to Ipswich, and 275, 281, 282, 286, 300, and 301 were there for some time. They were largely used for Continental specials, for which work some were quartered at Parkeston Quay, but 275, the bogie engine, occupied the position of Ipswich pilot, and took charge of any main line train of which the engine showed signs of distress.

During the same period 277, 288, 296, and 299 were at Norwich, and also the bogie engine 291, but this last engine was afterwards transferred to Lynn, and worked there for many years before being broken up in 1893. Wisbech became the custodian of Nos. 284 and 292, which worked regularly to London, and on this duty they were sometimes relieved by 280 and 283, then also in the Lynn district.

By this time the joint line from March to Doncaster was in full swing, and as it is a road eminently suited to single engines, naturally some of the old Sinclairs, rebuilt by this time with new boilers, took their share of the work. 285 at Cambridge, 295 and 303 at March, and 276, 278, and 290 at Doncaster were those which usually ran over "the joint," and for some time No. 290 worked on alternate days right through to London against the Worsdell compound engine 230 from the London end. In these days the only "Sinclair" remaining at Stratford was No. 289, which worked certain of the Continental trains to Parkeston Quay. An engine of this class usually worked the cross-country connection with the north express (4.48 p.m. from Doncaster) as between Ely and Parkeston Quay via Bury St. Edmunds. There were, however, at this time no through coaches, and Continental passengers from the north had a long weary wait at Ely whilst the train engine was engaged in searching for and excavating a string of somewhat seedy-looking carriages from the sidings in order to put together some sort of a "boat train."

The last two of this celebrated class to remain at work—0290 and 0295—found a job at Saffron Walden. A through train to London having been put on, it was worked by these two engines for some time, for the reason that the more modern express engines were then somewhat too heavy for the branch road. They were the last to be scrapped in 1894.

There is no doubt that the old "Sinclairs" did some wonderfully good work in their day, and at one time they were amongst the first rank of celebrated

Digitized by Google

express engines. The following are some records of their performances which I possess, of which the first is a run from Ely to Norwich with engine 288, and a load of nine coaches. The road is, of course, a very easy one :—

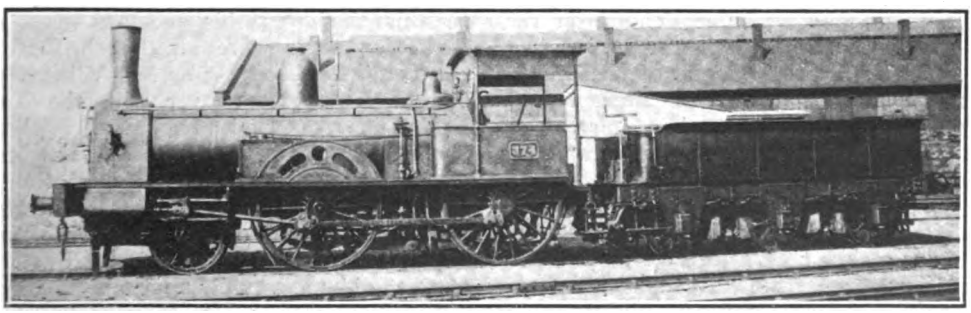
Miles.			
—	Ely	... dep.	1.57½
7	Mildenhall Road	...pass.	2.8½
12¼	Lakenheath ...	... „	2.15
16	Brandon	... „	2.19
23¼	Thetford	... „	2.28½
31	Harling Road ...	... „	2.38
34	Eccles Road ...	... „	2.42
37¾	Attleborough ...	... „	2.46½
43½	Wymondham ...	... „	2.54
52¾	Trowse	... arr.	3.6

The running average for the 52¾ miles was 46¼ miles per hour. No doubt the runs could have been done at a higher speed, but it should be remembered that the Great Eastern had no trains at this period which were booked at a running average of more than 43 m.p.h., and, moreover, that 46 m.p.h. from start to stop was a somewhat high average speed for that time. Further, the engine 288 had the old Sinclair boiler, carrying only 120 lb. pressure, and the train was not fitted with any continuous brake.

In August, 1879, on the 12.3 p.m. from St. Pancras, which was then one of the fastest Great Eastern expresses, No. 277 ran from Ely to Trowse, 52¾ miles, in 65½ minutes, with a load of 13 coaches, the average speed from start to stop being 48⅓ m.p.h.

Mr. Rous Marten in 1885 recorded an exceptionally smart performance by engine 290, then stationed at Doncaster, on the "seaside" express, to be mentioned later. This train was allowed 47 minutes for the 38¼-mile section from Spalding to Lincoln, and although the load was only a light one of seven coaches, it was an excellent performance to make up 7 minutes after a late start, and cover the distance in 40 minutes from start to stop. Thirty-five consecutive miles were reeled off at speeds of 60 to 65 m.p.h.

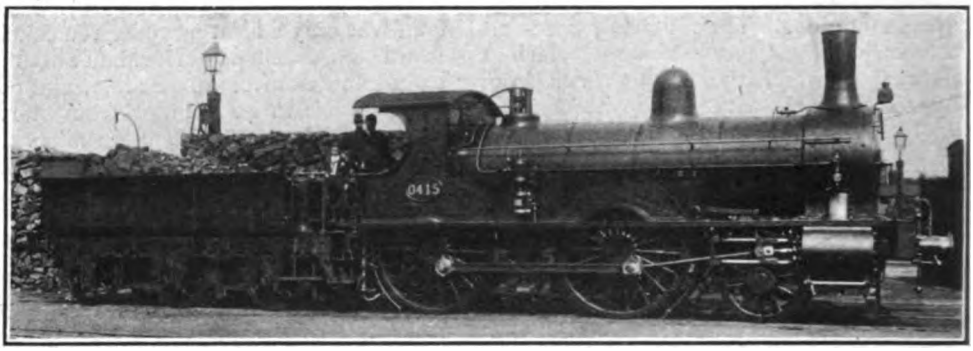
It has been mentioned above that although Norwich and London engines ran right through on certain trains via Cambridge, it was more usual to change engines at Ely. There has always been, to my mind, one outstanding feature of the Great Eastern train working in so far as the locomotive department is concerned. As "quick change" artistes, they reduced the changing of engines to a fine art. The incoming engine was detached from its train, bundled across the road, and attached to an outgoing train before the astonished observer could think "Jack Robinson." This, of course, applies to important roadside stations, and not to terminals, such as Liverpool Street, where such a method would obviously be impossible. In this respect, perhaps, the Great Eastern was faced by necessity. A large part of the railway is made up of cross-country lines through agricultural districts, and if the engine did not work a certain return train, it would have to wait for some time before another started. According to a story current at the time, the "quick change" enthusiasm led to the stranding of one of the mail trains. For many years the up and down Norwich mail trains crossed each other at Ely, and at one period each train was allowed 20 minutes there, during which time the engines were changed. The Stratford engine on the down mail was crossed over to return with the up mail, and a similar process was gone through with the Nor-



Photo] [*Locomotive Publishing Co., Ltd.*

SINCLAIR 2-4-0 EXPRESS GOODS ENGINE, NO. 374 (1859-1866)
Wheels, 6 ft. 1 in. Cylinders, 17 in. by 24 in.

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

2-4-0 EXPRESS GOODS ENGINE, NO. 0415 (SERIES 307 416), REBUILT AS A PASSENGER LOCOMOTIVE.
Wheels, 6 ft. 3 in. Cylinders, 17 in. by 24 in.

wich engine. Twenty minutes is not too much of an allowance for going through this process, even if the trains arrived punctually, and seeing that the engines had to turn and take water there were not many seconds to spare, since the whole of these operations had to be performed in darkness. Anyway, the story goes that the Stratford engine backed on to the up mail with about 2 seconds to spare, and then the human element entered into the matter and failed, for somebody forgot to couple up the engine. The guard gave the signal, and the engine set off gaily, and duly pulled up at Cambridge minus a most important item, viz., the mail train itself, left "marooned" at Ely. I beg to state that I accept no personal responsibility for this story, and relate it as it was given to me. I did think of submitting it to the "Claims (Goods) Department" of the railway, which is composed of a body of officials who spend a chequered career in pumping traders' and other assorted lies out of the well of truth, and who would doubtless have been able to give a valuable opinion on the subject. On the other hand, the incident is quite within the bounds of possibility, for the mail was at that time a very lightly loaded train, and a hurried or careless driver might run on a very dark night without noticing the absence of such a light load behind his engine.

Afterwards the working was altered, and for a time a Stratford engine worked the 5.15 p.m. from Liverpool Street to Norwich, and returned with the up mail, and later both the up and down mails were worked by Norwich engines.

Returning again to the passenger engines, there were, in addition to the "Sinclair" singles, only two other locomotives that were genuine express engines. These were the celebrated 4-4-0 coupled engines Nos. 301 and 302 (from 1880 onwards they were numbered 305 and 306, and were, perhaps, better known with these numbers), designed by Mr. S. W. Johnson, and completed at Stratford in 1874 after this gentleman had left to take charge of locomotive matters on the Midland. They had 6 ft. 7 in. coupled wheels, with 17 in. by 24 in. cylinders, and 140 lb. pressure.

A few years ago, just prior to and after his retirement, I had the pleasure of a good many talks with Mr. Johnson and of hearing some of his reminiscences. Although details of many of his earlier engines had passed out of his mind, he always retained a great affection for these two Great Eastern engines. He always claimed that they were the first 4-4-0 express engines of British standard inside cylinder design that were constructed. In this, however, his memory was at fault, for there were six North British 4-4-0 engines of 1871-3 by Mr. Wheatley, one of which went over with the Tay Bridge in 1879, and Mr. James Stirling had in 1873 brought out No. 6, the first of his celebrated Glasgow and South Western bogie express engines. But Mr. Johnson's designs dated, I believe, from 1872, although the two Great Eastern engines did not actually appear until 1874, about a year after Mr. Johnson had left for the Midland. But this much is certain, that the standard 4-4-0 design was

Digitized by Google

evolved by Mr. Johnson quite independently of the similar types on the Scotch railways mentioned. As far as bogies for express engines were concerned, he had already, in the summer of 1873, rebuilt the two "Sinclair" singles Nos. 51 and 291 with the addition of bogies.

Nos. 305 and 306 were somewhat ubiquitous on the Great Eastern, and were stationed at Ipswich, Stratford, Cambridge, and Lynn during the first 14 years of their existence before they were rebuilt in 1888. They were frequently employed upon important trains, and sometimes ran Royal specials, which had to work over sections of the line for which the later built engines were somewhat too heavy. I frequently saw them at St. Pancras, and for a time they ran St. Pancras-Cambridge expresses, usually the 12.3 p.m. ex St. Pancras, and the 7.3 p.m. up from Cambridge. In 1887 they were sent to Wisbech to replace the "Sinclair" singles on the Wisbech-London service. After they had been rebuilt they spent most of their days in the London district. No. 306 became the Tottenham pilot engine after 1891, and ended its career in 1897 on the St. Pancras trains after a mishap when ascending the Highgate Road bank. 305 became Liverpool Street pilot, and ended its days in 1898.

There was also another different type of 4-4-0 engine. These may be said to have been promoted from the ranks of the goods engines, and given commissions as express engines,* and were originally the 2-4-0 outside cylinder engines, with 6 ft. 1 in. wheels and 17 in. by 24 in. cylinders, built by Mr. Sinclair for goods trains. Mr. Sinclair had been locomotive superintendent of one of the Scotch railways, and one of the peculiarities of Scottish locomotive work of those days—even down to 1882 on the Caledonian—was the almost exclusive employment of four wheels coupled engines for goods traffic. Only the North British amongst the Scotch lines was an exception to this. Mr. Sinclair brought with him the same ideas, and did not build a single six wheels coupled engine for the Great Eastern during the nine or ten years that he was chief of the locomotive department of this railway. The 2-4-0 engines, of which there were 110, were, however, extremely useful machines for general work, and were often to be seen on local passenger trains, but for very many years they usually remained in the goods service, for which they had been built.

(To be continued.)

* The case of these engines is exactly paralleled by that of the 2-4-0 "express goods engines," 420 class, of the Caledonian Railway, rebuilt by Mr. Drummond as express engines.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

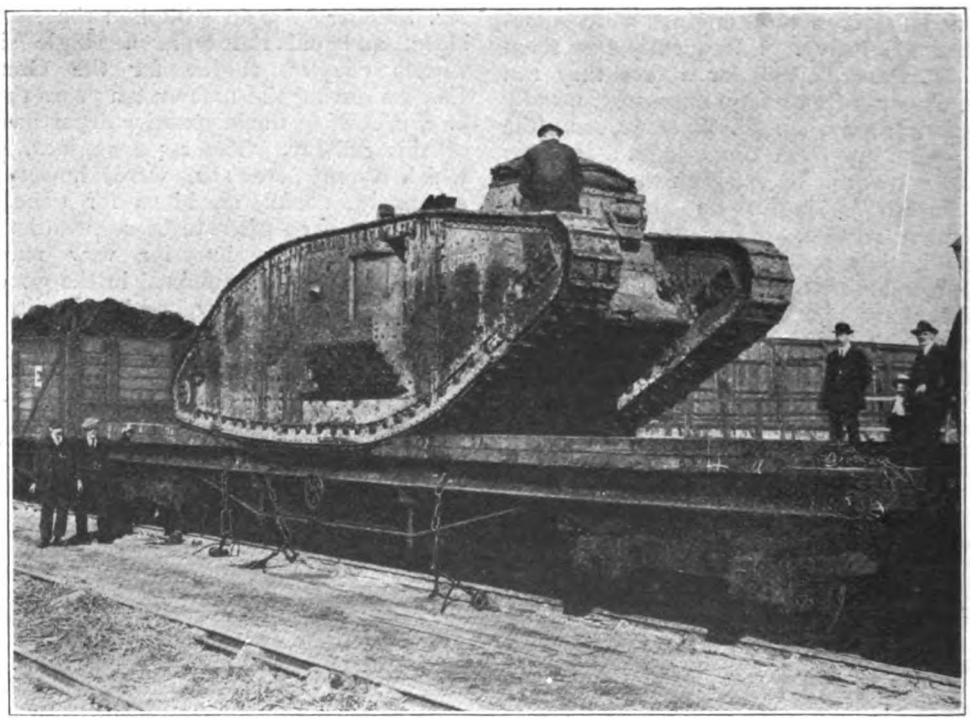
Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—
L. & N.W.: Jan., Feb., March, May, 1915. (All out of print except May.)
Great Northern: June, July, 1915. (Out of print)
M. S. & L.: Aug., Sept,, Oct, 1915. (Aug. out of print.) (and Feb. out of print.)
Great Western: Nov., Dec., 1915. Jan., Feb., March, April, May, June, July, Aug., 1916. (Jan.
Glasgow & S W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916. Jan., Feb., March, April, May, 1917. (Jan. out of print)
South Eastern: June, July, Aug., 1917.
Lancashire and Yorkshire Railway: Sept, Oct., Nov., 1917.
London, Chatham and Dover Railway: Dec., 1917; Jan., Feb., 1918.
Caledonian Railway: March, April, May, June, 1918.

In August Mr. Ahrons will continue to deal with the Great Eastern Railway.

Digitized by Google

A Tank on Tour.

BY the courtesy of the North Eastern Railway, we are able to illustrate the military tank *Egbert*, loaded on a North Eastern Railway truck at Darlington. The original photograph was taken by Mr. Ramsey, of the Chief Mechanical Engineer's office, North Eastern Railway.



THE TANK "EGBERT" ON THE NORTH EASTERN RAILWAY AT DARLINGTON.

The truck on which the tank is loaded is a N.E.R. 40-ton quintuple wagon stripped of its bolsters and refitted with a new floor and special packing.

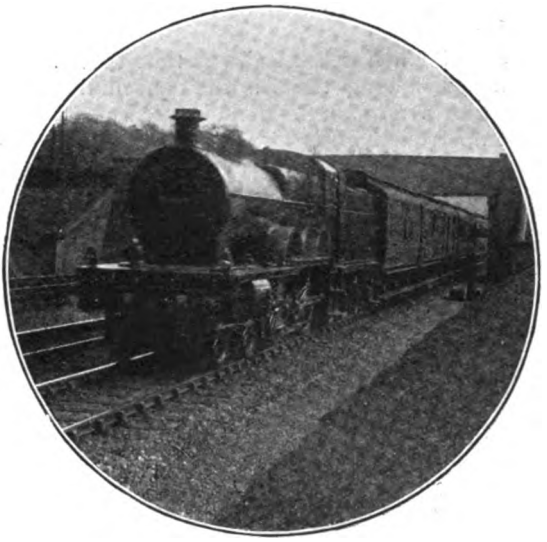
It is noteworthy that, unlike other big loads, the tank does not require the services of a crane or other loading appliance, being able to wriggle on or off a railway truck either sideways or over end. The wagon, however, needs to be stayed by the underpacking during the process lest it should tilt up catapult fashion.

The tank illustrated, *Egbert*, has seen active service overseas, and has since done great work in connection with the sale of British War Bonds and War Savings Certificates.

Digitized by Google

British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Down Leeds and Bradford express between Ampthill and Millbrook.

4-4-0 3-cylinder compound locomotive, No. 1044.

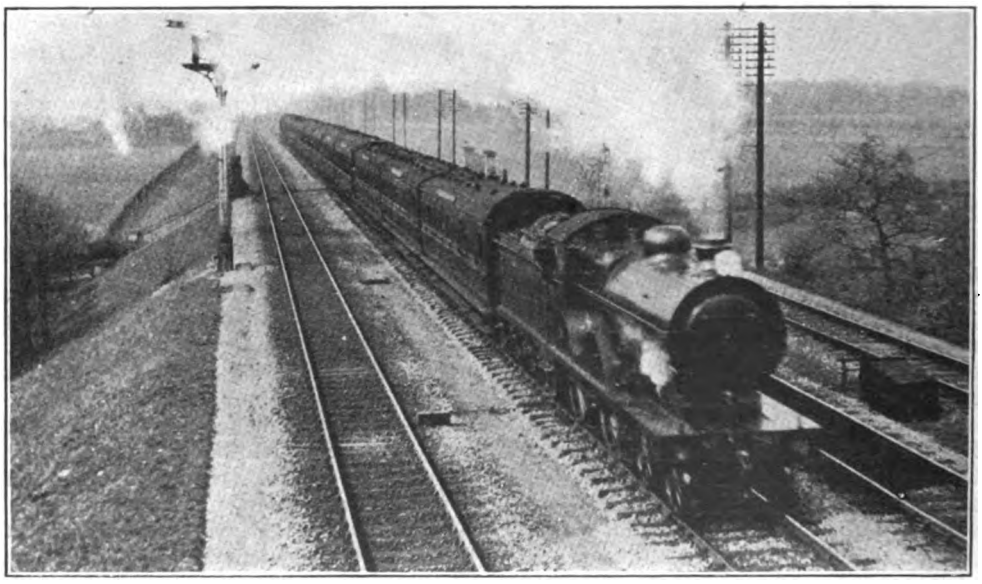
AS I remarked last month, commenting on time-table alterations to-day is a thankless task. So rapidly do changes succeed one another that one's comments, written some five weeks before they finally reach the eye of the reader, are by that time out of date already. The May issue of "Bradshaw," which was not procurable until the 10th of that month, and left the unfortunate business traveller somewhat "in the air" during that period, revealed another crop of all-round curtailments and decelerations, in some cases of trains to which I actually referred in the last issue. For instance, the Great Central Railway no longer runs between London and Manchester in 4 hrs. 40 min., the two trains concerned—the 3.15 p.m. down and the 2.15 p.m. up—both having their times increased to a round 4¾ hours. The former adds 2 min. to Leicester (now 103.1 miles in 116 min. = 53.3 m.p.h.), and 1 min. thence to Nottingham (23.4 miles in 27 min.), while the Sheffield-Penistone and Penistone-Guide Bridge stages are each increased by a minute, to 24 and 35 min. respectively. So this express now ties in overall time with the 5.20 p.m. Euston to Manchester. But there is a slight difference in the load, as the latter train, when last I saw it, took as far as Crewe a net train weight of 473 tons!

The 2.15 up is slowed by 3 min. between Guide Bridge and Penistone to a total of 38 min. for this difficult 23.4 miles' length (presumably in order that heavier loads than previously may be taken over Woodhead summit unpiloted), by 1 min. Sheffield to Nottingham (now 51 min.), 1 min. thence to Leicester (27 min.), and 1 min. further on to Woodford (41 min.), the last-mentioned minute being deducted from the Woodford stop. There are few further alterations on the Great Central Railway, save that the 2.35 a.m. down "newspaper" is cut short at Nottingham, the 8.45 a.m. down Manchester calls at Lutterworth, and the 6.10 p.m. down Bradford is allowed 2 min. extra to Brackley (63.8 miles *viâ* Wycombe in 77 min.), and 1 min. more between Leicester and Nottingham (total 27 min.), while retaining its smart schedule of 36 min. for the 34 miles from Woodford to Leicester. The Great Central time-table, indeed, still incorporates the bulk of the fastest point-to-point times left in this country.

Some fairly extensive changes came into operation on the Great Northern Railway on May 1st, with which may be associated certain concurrent alterations

Digitized by Google

in the North Eastern Railway time-tables. Principal among these is the cancellation of the afternoon Scotch expresses at 2 p.m. from King's Cross to Edinburgh, and 1.45 p.m. in the reverse direction. On the last occasion on which I saw the former, it was made up to 15 bogie vehicles, so that the loss is a substantial one. Passengers can still travel to York, Darlington, and Newcastle, however, by the 1.30 p.m. down, while in the reverse direction a service is given from Newcastle to London at 3 p.m., the 3.50 p.m. up being started 50 min. earlier, expedited by the omission of stops at Durham, Ferryhill, Pilmoor, and Alne, and run p.m.). This is 5 min. slower than before, with the 5 min. stop at Doncaster cut out, and a much lightened load. Beyond York the North Eastern Company has now made the Northallerton stop permanent instead of conditional, booking the 30 miles from York to that point in the smart time of 32 min. (=56.3 m.p.h.), while the arrival at Newcastle, which the time-table previously led one to suppose was at 11.14 p.m., but which was more usually between 11.30 and midnight, is now booked at 11.25 p.m., and is much more likely to be observed than before. The second portion from King's Cross leaves



Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Down Continental express. Large superheater 4-4-0 locomotive, No. 781.

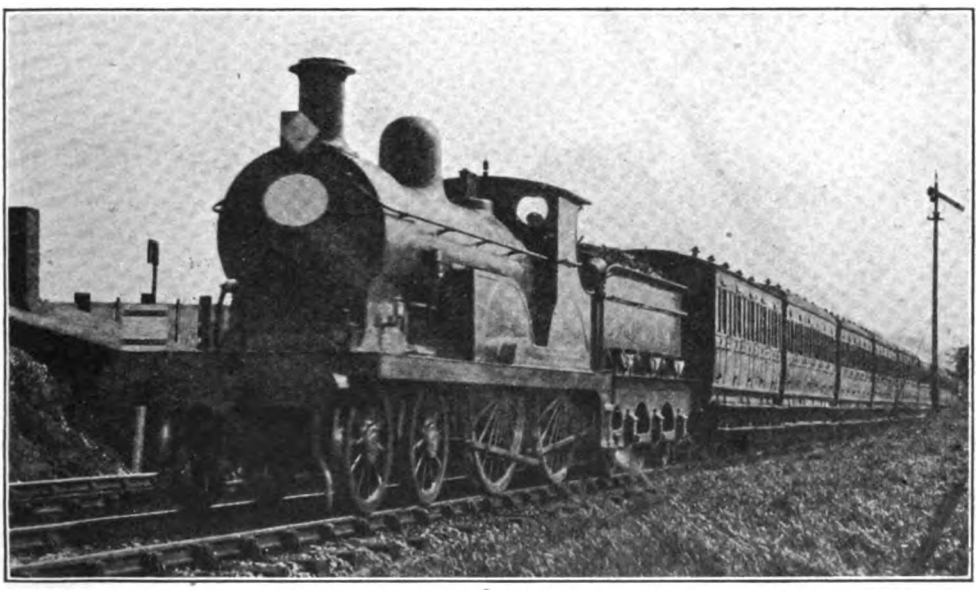
forward from York to Doncaster to connect there with the 5.30 p.m. Great Northern express from Leeds to London. The latter now calls at Grantham as well as Peterborough between Doncaster and King's Cross, and is due 10 min. later than heretofore at 10.10 p.m.

Another important alteration is that the 5.30 p.m. down express is split up into two of its three component parts, the first portion becoming once again a purely Newcastle express, and calling at Grantham only (7.43-7.48 p.m.) to York (9.30 at 5.40 p.m., calls once again at Peterborough, but still retains the Grantham stop; it serves Leeds and Hull, and is considerably slowed to both places, by 27 and 23 min. respectively. *Apropos* of the division of the 5.30 p.m., it is somewhat mysterious that, although for many weeks in April—as some runs about to be described will show—eight or nine eight-wheelers for Newcastle, and three each for Leeds and Hull sufficed to convey the passengers, the new 5.30 is already swollen to a regular load of ten "eights,"

Digitized by Google

and the 5.40 to 11 "eights" and a Gresley "twin," making a grand total of 90 instead of 56 or 60 axles.

On the down journey, generally speaking, standard times now become 101-103 min. to Peterborough, 76.4 miles, and 150 min. to Grantham, 105.5 miles; 42-45 min. from Peterborough to Grantham, 29.1 miles; 63-65 min. from Grantham to Doncaster, 50.5 miles; and 110-115 min. from Grantham to York, 82.7 miles. Thus the times by the best trains from London to York or Leeds are now about 4½ hours, and to Edinburgh 9¾ hours. The down night expresses are altered, the 7.15 p.m. "Scotsman" starting at 7 p.m., and taking up the Newark and Retford stops of the 8.30 p.m. down (now 8.25 p.m.), except on Saturdays, when the former does not run, and the latter then makes these calls as usual. Similarly, the 10.30 and 10.45 p.m. Scotch expresses each start 15 min. earlier, and the latter calls additionally at Peterborough. Other than the alterations already mentioned, the principal change on the up journey is the starting of the 10.15 a.m. from Leeds to London at 9.20, the attaching to it at Doncaster of the Hull portion previously added to the up morning Newcastle express—a desirable change from the standpoint of equalising loads that I have before now advocated in these columns—and the running of the former in advance of the latter to London, with additional call at Retford, and an arrival at 2 p.m. The Newcastle train, which had already ceased to call at Grantham, is but little altered, and now arrives at 2.15 p.m., which is nearer its average time of arrival than the previous 2.7 p.m., as it is often a very heavy train. Up timings are similar to those in the reverse direction, *e.g.*, 98-105 min. from Peterborough to London, 144-145 min. from Grantham-



Photo] [*E. A. Gurney-Smith.*

SOUTH EASTERN AND CHATHAM RAILWAY.

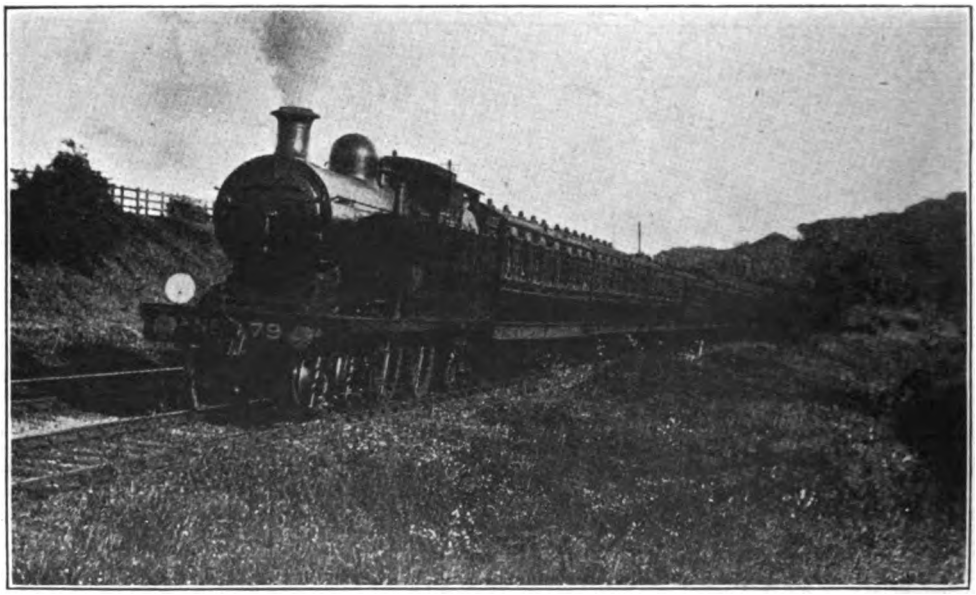
Up express near Chelsfield.

London, 40 min. from Grantham to Peterborough, 104-109 min. from Doncaster to Peterborough, and 114-115 min. from York to Grantham. The up day "Scotsman" is now due to arrive at 7.50 p.m. instead of 7.30 p.m., similarly to the 10 a.m. down, but, curiously enough, although it was generally fairly punctual on the old schedule, on the three occasions on which I have seen it during the first fortnight of its alteration, it has been 5, 10, and 30 min. behind time into London.

On the North Eastern Railway, in

Digitized by Google

addition to the withdrawal of trains already mentioned, the 9.38 a.m. from York to Edinburgh—a very popular express—and the return train at 5.15 p.m., are no more. Times of the principal expresses from York to Newcastle become 108-111 min. (80.5 miles); from Newcastle to Berwick, 89-92 min. (66.9 miles); and to Edinburgh, non-stop, 185 min. (124.4 miles); in the reverse direction these schedules are 109 min., 94 min., and 181 min. respectively, with 55-59 min. for the 44.1 miles from Darlington to York. The most drastic change not already mentioned is the withdrawal of



Photo] [*T. B. Welch.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.
Brighton-Victoria train. 4-4-2 tank engine, No. 79.

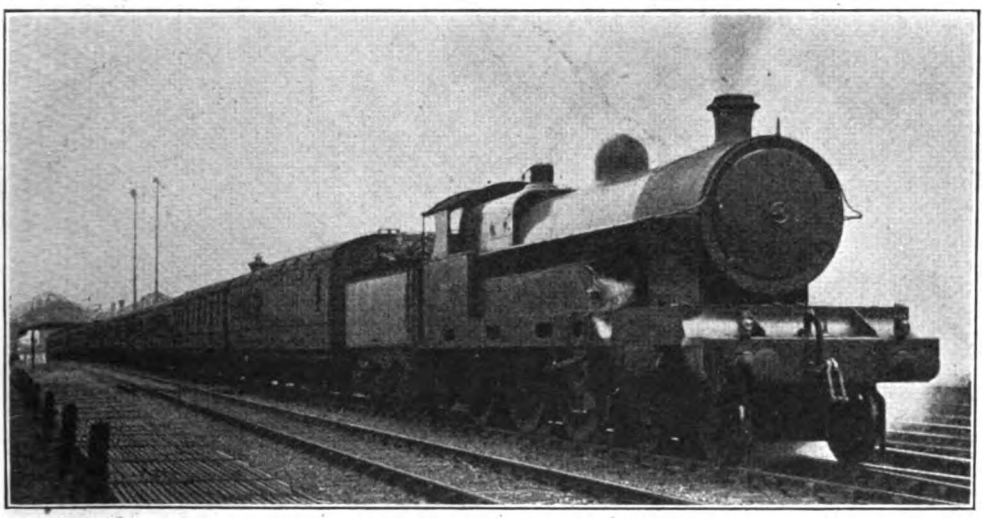
the 12.40 p.m. from Newcastle to York, and the putting back of the 1.55 p.m. *ex*-Newcastle to 12.45 p.m., so as to precede and pick up for the up day "Scotsman." Further, the Durham stop of the 9.53 a.m. from Newcastle to York is transferred to the 10.28 a.m. (now the 10.5 a.m.) London express, which is due to reach King's Cross at 5.0 instead of 5.10 p.m. Such are the principal North Eastern changes; point-to-point times, as a whole, are not altered to any extent worth mentioning.

A line whose services are seriously affected by the May alterations is the Great Eastern Railway. To the credit of this company, it may be said that although—as revealed in a recent issue of "The Great Eastern Railway Magazine"—some 30 per cent. more engines have been released for war uses overseas and elsewhere than the agreed quota, yet the main line train services operating till the end of April were at least equal to, and in some respects superior to, the standard October-June services in force prior to the war. Now, however, far-reaching changes have taken place. The Cambridge main line is, perhaps, the worst sufferer, as, in replacement of withdrawn stopping trains, all down expresses except the 4.30 p.m. (a combination of the previous 4.20 and 4.50 p.m. trains) and 5.52 p.m. *ex*-Liverpool Street, call at all stations between Bishop's Stortford and Cambridge. Of the two last-mentioned trains, the former calls at Harlow, Stortford, and stations north of Audley End, while the latter retains its previous schedule. In the up direction the expresses due in Liverpool Street at 10.19 a.m., 12.36, 5.15, and 10.34 p.m. are withdrawn, but the

Digitized by Google

remaining trains are not greatly modified south of Ely, save for an increase of the Cambridge-Stortford time to 36 min. The fast trains between Ely and Norwich are for the most part amalgamated with the "slows," while the remaining four express trains on the G.N. and G.E. joint line are withdrawn.

As regards the Colchester main line, non-stop trains between Ipswich and Norwich no longer exist, as fast and semi-fast or slow trains over this section are all now amalgamated. South of Ipswich the 8.15 a.m. down takes up the slow working of the previous 9.15 a.m. train, and is cut short at Ipswich; the 12.30 p.m. (Saturday only) down Norwich and Yarmouth express disappears; the 3.10 and 3.22 p.m. *ex*-Liverpool Street are fused into one vast train at the former time, calling at Chelmsford, Colchester, and Manningtree, whose standard load out of London is one of 64 axles; the 5.23 p.m. Cromer and Yarmouth express is allowed 4 min. more to Ipswich (total 91 min.), and the erstwhile Cromer portion terminates at Norwich; the 7.45 p.m. to Lowestoft does not run beyond Ipswich. In the up direction the expresses due in London at 10.28 a.m., 1.58 and 6.32 p.m. are withdrawn, while the schedules of certain other trains are slightly "loosened," the Ipswich-London time of the Cromer express due at 11.25 a.m. (late 11.18), for example, being increased from 86 to 90 min., that from Marks Tey of the following Yarmouth train from 58 to 61 min., and so on. In the main, however, the point-to-point timings on the G.E.R. remain much as previously, and hard locomotive work will be required on such trains as the 3.10 p.m. *ex*-Liverpool Street, with heavy loads and frequent stops, although some relief is afforded by the use of non-corridor vehicles in place of the heavy corridor stock previously employed. Very little change is seen in the best trains on the Southend service, the 8.15 a.m. up express, for example, retaining its excellent time of 60 min. to town with a tare load of 220 tons, and a 2-min. intermediate stop at Brentwood.



Photo] [*Chas. S. Lake.*

LONDON AND NORTH WESTERN RAILWAY.

Up Liverpool express leaving Bletchley for Euston.

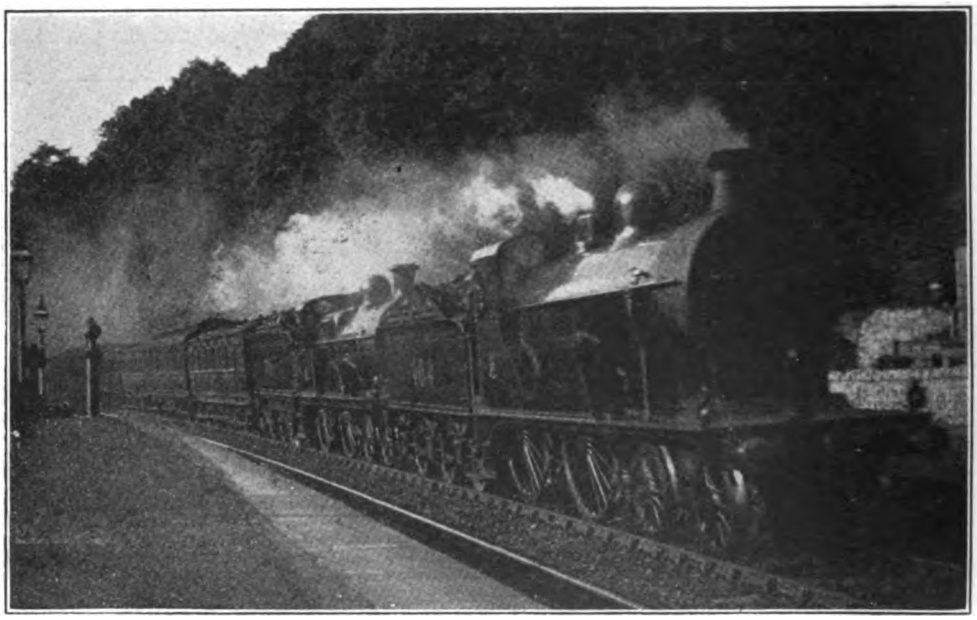
"Claughton" Class, 4-cylinder 4-6-0 superheater locomotive, No. 1327, *Alfred Fletcher.*

Material slackenings are made in the London, Brighton and South Coast services, although scarcely any important trains are withdrawn. Between London and Brighton the non-stop time now degenerates to 75 min., representing merely a 40 m.p.h. average speed; 74 min. is the corresponding time to Lewes, with ½-mile less journey, but the added hindrance of Keymer Junction slack. On the up journey there is a

Digitized by Google

standard express time of 58 min. from Brighton to East Croydon (in place of the previous "best" of 48 min.), while the only two non-stop expresses to town take 77 and 81 min. respectively. The last-mentioned—leaving Brighton at 1.20 p.m. —is a curious train, as it originates at Eastbourne, running thence non-stop to Brighton, where it picks up a through Worthing portion before proceeding to London. A combined through express from Eastbourne, Brighton, and Worthing to London is somewhat of a novelty.

There are some further slight adjustments on the neighbouring London and South Western line, more especially west of Salisbury. The 11.0 a.m. and 3.25 p.m. Plymouth expresses start at 10.50 a.m. and 3.15 p.m.; the former takes 2 min. more to Salisbury (103 min.), 5 min. extra to Sidmouth Junction (107 min.), and 1 min. more thence to Exeter (17 min.); the latter uses its extra 10 min. in an additional stop at Andover Junction, but is unaltered thence to Exeter, save for a 1-min. increase to 81 min. on the Templecombe-Exeter stage. In the up direction the 9.55 a.m. *ex*-Plymouth leaves at 9.50 a.m., but is 5 min. later away from Exeter (now 12.10 p.m.); 2 min. more are required thence to Sidmouth Junction, and 3 min. extra (total 103 min.) from Sidmouth Junction to Salisbury, so that the arrival in London, at 4.24 p.m., is 10 min. later than previously. The 66-min. times to Yeovil Junction of the 2.10 and 4.22 p.m. expresses *ex*-Exeter now become 69 min. in each case, and sundry other additions of a minute or so are made to the times of certain other trains.



Photo] [*Raymond Walker.*

MIDLAND RAILWAY.

Express train entering Matlock Bath Station.

Pilot engine, rebuilt 4-4-0, No 404 (Class 2); train engine, Belpaire 4-4-0, No. 706 (Class 3).

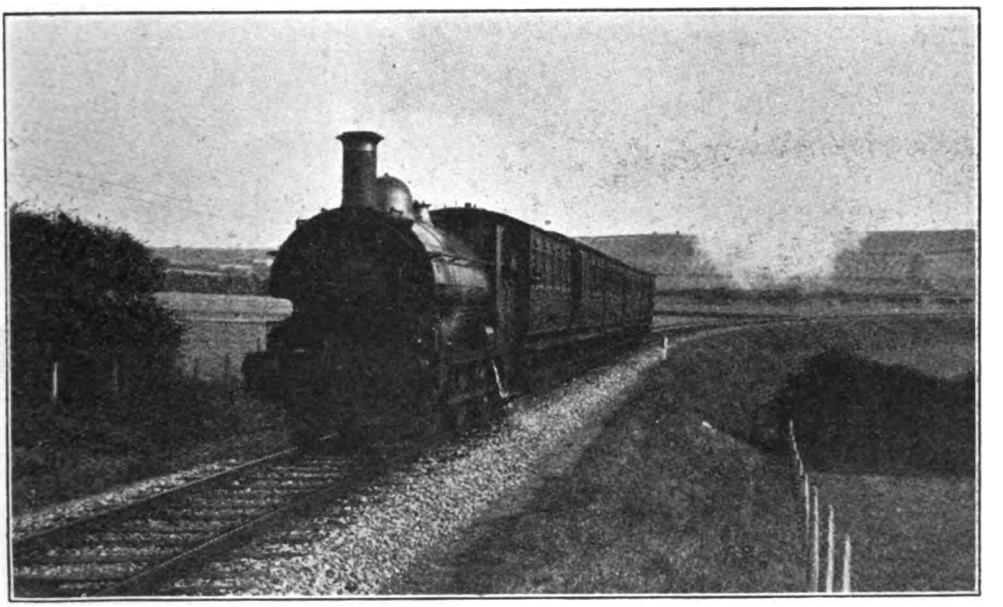
Elsewhere there is "nothing of special interest to report." Most of the bookings on the North British Railway between Edinburgh and Carlisle and Edinburgh and Aberdeen respectively are increased by 5-10 min., but the majority of the smart Edinburgh-Glasgow times are retained. Some drastic reductions have taken place in Ireland, all the Great Southern and Western Company's expresses being drastically decelerated except the Limited Mails. Of these the up train, beyond starting 65 min. earlier

Digitized by Google

(at 2.50 p.m.), is unaltered, while the down train to Cork is actually bettered by calling instead of slipping at Thurles, with no consequent increase in journey time. The fine service of the Great Northern Railway of Ireland between Dublin and Belfast also suffers, several of the expresses having a number of stops inserted in view of the withdrawal of connecting slow trains, while the cancellation of the 6.30 p.m. down express puts an end to the very fast run of 54¼ miles from Dublin to Dundalk in 63 min. made by this train. But several sharp bookings remain, such as Dublin-Drogheda in each direction, 31¾ miles in 38 min.; Belfast-Portadown, 25 miles in 31 min.; Lisburn-Portadown, 17½ miles in 21 min.; Lurgan-Belfast, 20 miles in 24 min.; and so on. In the case of this line, also, save for an earlier start by an hour of the up train, the point-to-point times of the Limited Mails are not altered.

Taken all round, the time-table alterations for April and May, added to our first real "war" time-tables of January, 1917, form a melancholy subject for review in the month of which "Brunel Redivivus" was wont to whet our pre-war appetites with glowing descriptions of increasingly enterprising summer train services. Nevertheless, the more cheerfully we accept conditions as they are, the sooner will the happier conditions of retrospect, we believe, be restored to us. But even the travelling conditions of to-day, as I have noted on a number of recent journeys, are by no means without their interest, though they do not partake of the character of records, and I wish in the present issue to detail certain of these experiences on the Great Northern Railway.

On the 5.30 p.m. *ex*-King's Cross I had five runs immediately prior to the recent division of the train, but most of them rather disappointing in character, although this has been an exceptionally difficult train to work. All circumstances considered, the best was probably one behind superheater "Atlantic" No. 1454, with 15 bogies, weighing 434 tons empty and about 460 tons full. We were through Finsbury Park in the good time of 8 min. 10 sec., but suffered a severe p.w. check south of Potters Bar, and so took 27¼ min. to that station, 12.7 miles; 33 min. 40 sec. to Hatfield, 17.7 miles;



Photo] [*E. A. Gurney-Smith.*

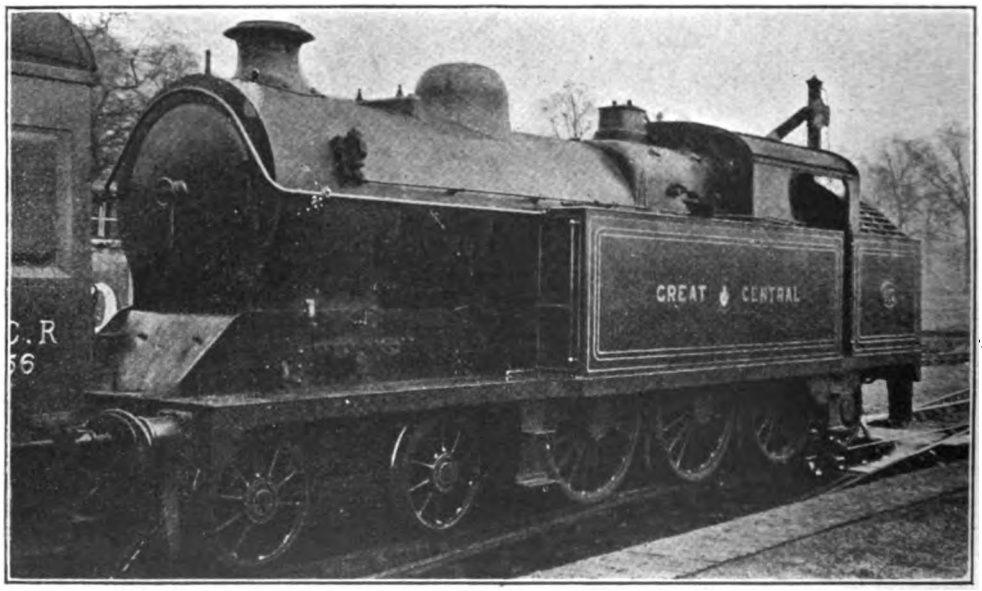
GREAT WESTERN RAILWAY.

Bridport branch train near West Bay.

Digitized by Google

and 49 min. 20 sec. to Hitchin, 31.9 miles. After that, however, we did well, touching 74 m.p.h. at Three Counties, 68 at Biggleswade, 66 at Offord, and 71½ at Holme, with minima of 64½ m.p.h. beyond Arlesey, 56½ at St. Neot's, and 46½ up to Stukeley bank. So the 27 miles from Hitchin to Huntingdon were covered in 24 min. 40 sec., and the 17.5 miles thence to Peterborough in 18 min. 20 sec. —total 92 min. 20 sec., or just over 89 min. net from London. Beyond Peterborough we could not get up to more than 53 m.p.h. on the level beyond Werrington, and fell to 33 at Stoke, so taking 16 min. 10 sec. from Peterborough to Essendine, 12.2 miles, 16 min. 50 sec. thence to Stoke, 11.5 miles, and 6 min. 50 sec. on the final 5.4 miles into Grantham—total 132 min. 10 sec. for the 105.5 miles journey, or 129 min. net. This was a loss of 4 min. on schedule, although the gross time was 50 sec. inside the new allowance, and that with a 50 per cent. heavier load, and over 3 min. of delays.

On two of the runs, when the load totalled 14 eight-wheelers, 404 and 407 tons tare and 425 and 430 tons full respectively, superheater 4-4-2's Nos. 1454 and 1452 had to deal with exceptionally bad weather conditions—very strong east and north-east winds accompanied by driving rain—in addition to delays, which seriously affected time-keeping. Good starts were made—to Finsbury Park in 7 min. 40 sec. and 8 min. 5 sec., and Potters Bar in 24½ and 25 min., but then No. 1454 lost 5½ min. by reason of signals "on" right through Hitchin, and No. 1452 as much as 7 min. in consequence of a mishap on an adjacent line at Hatfield. Very fair work was done beyond Hitchin on the first occasion, speed recovering to 67 m.p.h. at Sandy, and not falling below 58½ at St. Neot's, so that Huntingdon was passed in 76 min. 10 sec., or 70¾ min. net; on the second run, however, although we touched 72½ m.p.h. at Three Counties, and maintained 69 through Biggleswade, the minimum at St. Neot's was only 53, and so we took 79 min. 5 sec., or 72 min. net, to Huntingdon. Immediately beyond Huntingdon on each run we had a bad permanent way slack, hampering the ascent of Stukeley bank, and as the wind caught us badly on each occasion in the descent of Ripton bank, both engines



Photo] [*A. B. MacLeod.*

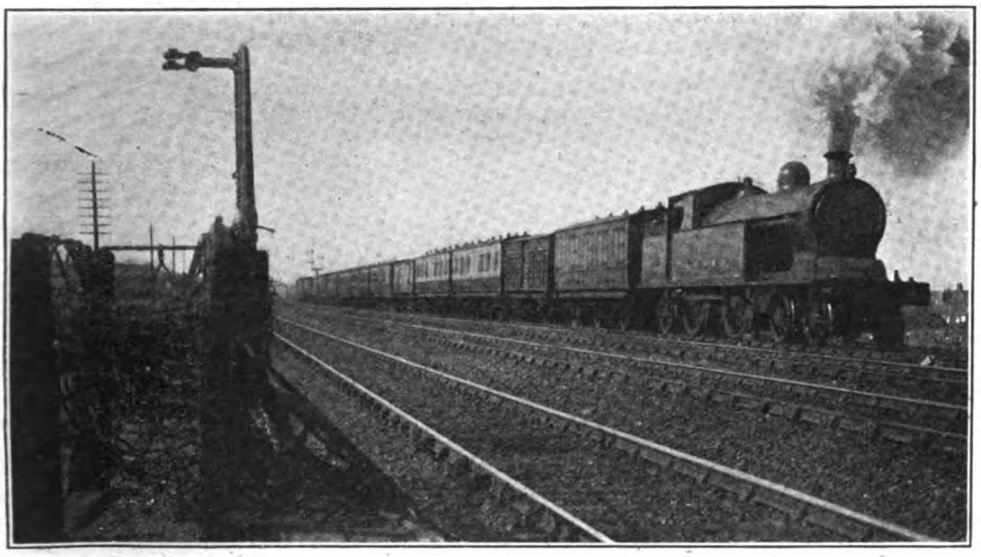
GREAT CENTRAL RAILWAY.

4-6-2 superheater tank engine, No. 452, at Pinner.

Digitized by Google

only touched 67 m.p.h., and consequently occupied 97 min. 5 sec. and 99 min. 50 sec., or 88¾ and 90½ min. net, to Peterborough. Beyond Peterborough we were seriously checked on each run by the 4.20 p.m. down "slow" ahead of us—the inveterate foe of the 5.30 p.m. down so far as keeping time is concerned—so that our eventual times to Grantham were 145 min. 55 sec. and 145 min. 35 sec., or about 130 and 133 min. net.

A somewhat disappointing run behind No. 1455 was made on a fine night, with only one check, the load being again 14 bogies, in this case weighing 411 tons tare and 440 tons full. We passed Finsbury Park in 7 min. 40 sec., and although observing the p.w. check at Potters Bar, breasted that station in 23 min., and Hatfield in the unusually good time of 28¼ min. But thereafter the work fell off, as speed dropped to 43 m.p.h. at Woolmer Green, did not rise above 72½ at Three Counties and 71½ at Holme, and fell to 54 at St. Neot's and 42½ up Stukeley respectively. So we took 44 min. 40 sec. to Hitchin, 69 min. 20 sec. to Huntingdon, 89½ min. to Peterborough, 105 min. 5 sec. to Essendine, 122 min. 5 sec. to Stoke, and 128 min. 55 sec. to Grantham. Net times were about 1 min. less than these, but after so good a start, it should have been easily possible to make a punctual arrival at Grantham. A 16-coach load, weighing empty 443 tons and full 475 tons, proved altogether too much on a very windy and wet night for No. 1454. Slipping badly at the start, she needed 10¾ min. to get through Finsbury Park, 30 min. 10 sec. to Potters Bar, 36¾ min. to Hatfield, 52 min. 50 sec. to Hitchin, 78 min. 5 sec. to Huntingdon, 98 min. 5 sec. to Peterborough, 116¾ min. to Essendine, 135 min. 35 sec. to Stoke, and 143 min. 5 sec. to Grantham—a loss of 18 min. on the old schedule. But this was, perhaps, excusable, as the conditions could hardly have been worse.



Photo] [*Chas. S. Lake.*

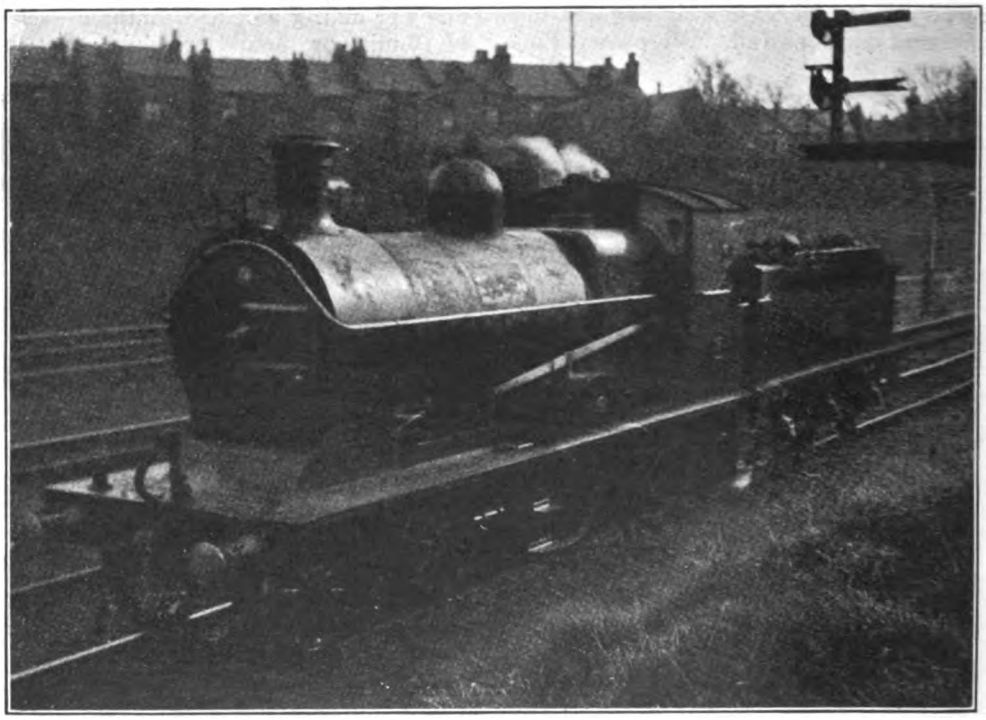
LONDON AND NORTH WESTERN RAILWAY.

Up slow train for Euston passing postal nets at Bletchley South.
4-4-2 "Precursor" tank engine.

By comparison, a run on the easily timed and now defunct 2 p.m. down "Scotsman" was quite exhilarating, as well as being novel, in that for the first time in my Great Northern experience (save only on the 5 p.m. *ex*-King's Cross) we were piloted out of the terminus, the load being one of 66 axles. To haul this train, weighing 461 tons empty, and little, if at all, short of 500 tons full, as it was simply packed, we had the services of No. 298, a 4-4-2 recently superheated,

Digitized by Google

piloted by a rebuilt 4-4-0 of Class W, No. 1314. The latter came off at Potters Bar, and this point was reached in the smart time of 20½ min., Finsbury Park having been passed in 6 min. 20 sec. Restarting, after a stop of 130 sec., No. 298, unaided, began quite brilliantly with this tremendous train, touching 61½ m.p.h. at Hatfield, only falling to 46½ at Woolmer Green, reaching 74 at Three Counties, and even sustaining 68 as far as Biggleswade, after which the running eased down very markedly. So runs in the same order, we had No. 272—another recently superheated 4-4-2—to make the 56 min. run over the ensuing 50.5 miles' length to Doncaster, with the 460-ton load. The start was very fine, Newark, 14.6 miles, being passed in 17 min. 10 sec., at a sustained speed of 70½ m.p.h., and Carlton, 20.9 miles, in 23 min., but subsequent running was by comparison poor, as we fell to 34 m.p.h. at Markham, taking 32 min. 35 sec. to that point (28 miles from Grantham), 38 min. 40 sec. to Retford (33.1 miles),



Photo] [*A. B. MacLeod.*

MIDLAND AND SOUTH WESTERN JUNCTION RAILWAY.
4-4-0 locomotive, No. 6, at Cheltenham.

Hatfield, 5 miles, was passed from Potters Bar in 8 min. 5 sec.; Hitchin, 19.2 miles, in 23½ min.; Sandy, 31.4 miles, in 34 min. 5 sec.; Huntingdon, 46.2 miles, in 49 min. 35 sec.; Peterborough, 63.7 miles, in 70¼ min.; and Grantham, 92.8 miles, was reached in 114 min. 10 sec., or 136 min. 50 sec. from King's Cross. We were thus over a minute early, and this after the easiest of running north of Sandy.

North of Grantham, taking the six and 59 min. 20 sec. to Doncaster. With only 36 axles beyond Doncaster, 251 tons tare and 265 tons full, however, No. 272 made some amends, maintaining 62½ m.p.h. on the level from Balne almost to Selby, and passing Balne, 10 miles, in 13 min. 5 sec.; Selby, 18.4 miles, in 21½ min. (at 25 m.p.h.); Escrick, 25.1 miles, in 30 min. 40 sec.; so that York was reached, after a bad signal slack at Naburn, in 42 min. 20 sec., or 40¼ min. net. Allowance for this 32.2 miles,

Digitized by Google

including Selby service slack, was 42 min.

On the two wet and windy nights Nos. 298 and 272, with 425 and 430 tons respectively from Grantham, both made good running under the adverse conditions prevailing. Newark was passed in 17 min. 50 sec. and 17 min. 20 sec.; Carlton in 24 min. and 23 min. 35 sec.; Markham in 33½ min. and 33 min. 5 sec. (at 39 and 40½ m.p.h.); Retford in 38 min. 55 sec. and 38 min. 35 sec. (at 67 and 66 m.p.h.); Bawtry, 42.2 miles, in 47 min. 55 sec. and 47 min. 40 sec.; and, after minima of 47 and 45½ m.p.h. at Piper's Wood, Doncaster was reached in 57 min. 40 sec. and 57 min. 35 sec. Out of Doncaster No. 272 did the better work, the times, with 240 tons in each case, being: To Balne, 13¾ and 13 min.; to Selby, 23¼ and 23 min. (here No. 272 slackened speed much the more vigorously); to Escrick, 32 min. and 31 min. 10 sec.; and to York 41 min. 20 sec. and 40 min. exactly. It was somewhat striking that there was no greater variation than 70 sec. between the actual station passing times of the two runs the whole way from Corby to Northallerton, a distance of 121 miles, including the times of three stops, which I should imagine to be almost in the nature of a record.

By far the best work between Grantham and Doncaster was done by No. 273, another superheated "Atlantic," in taking over No. 1455's 440-ton train. On this evening we passed Newark in the splendid time of 16½ min., at 70½ m.p.h.; Carlton in 22 min., at 64½ m.p.h.; Markham in 30 min. 25 sec., at 44 m.p.h.; Retford, at reduced speed after attaining 66 m.p.h., in 35¾ min.; Bawtry, after a maximum of 65 m.p.h. at Scrooby troughs, in 44 min. 55 sec.; then, having fallen only to 48½ m.p.h. at Piper's Wood, and having run under very easy steam on into Doncaster, we stopped there in 55 min. 10 sec. from Grantham. This was a noteworthy run, and the time could have been cut to 54 min. without difficulty by a faster finish, and a little less scrupulosity at Retford. On to York, with 240 tons, we passed Balne in 12 min. 40 sec., Selby in 22 min., Escrick in 30 min. 35 sec., and reached York, after delays at Naburn, in 43 min. 25 sec., or 40 min. net. The 475-ton load was too much for No. 1455 north of Grantham, and on that occasion we took 18 min. 10 sec. to Newark, 34 min. 5 sec. to Retford, and 59 min. 20 sec. to Doncaster, but with 295 tons on the final stage we managed to pass Selby in 24 min. 25 sec., and reach York in 42¼ min. Continuing with the down "Scotsman" from Grantham, No. 1433, not yet superheated, had an easy task, even with 500 tons, and passed Newark in 19 min. 5 sec., Retford in 44 min., Doncaster in 64 min. 55 sec., Selby in 87 min. 25 sec., and reached York in 108 min. 20 sec., 3 min. 40 sec. under the 112 min. allowance. In this way, load notwithstanding, we gained in all 4½ min. between King's Cross and York, although admittedly on a very easy schedule.

My up journeys were made principally on the morning express from Newcastle, at that time due in London at 2.7 p.m., but now at 2.15 p.m. The respective time allowances were then 44 min. from York to Doncaster, 98 min. thence to Peterborough, and 98 min. on to London, which, easy though they may appear, were a fairly tough proposition with the loads obtaining until the transference of the Hull portion recently. The two first-mentioned times are now increased to 45 and 104 min. respectively, only the Peterborough-King's Cross allowance remaining unaltered. From York, on three different occasions, we had trains of 11, 15, and 12 eight-wheelers, representing 307, 404, and 334 tons tare load and 330, 435, and 360 tons full load respectively; the engines were Nos. 983 and 252, small non-superheater "Atlantics," on the first two runs, and a large non-superheater 4-4-2, whose number I did not catch, on the third. We passed Selby, 13.8 miles, in 18 min. 40 sec., 19 min. 50 sec., and 20 min. 40 sec. (on the last run we had been slightly checked by signal at the start); Balne, 22.2 miles, in 29½ min., 30 min. 40 sec., and 31 min. 35 sec.; and reached Doncaster in 40 min. 10 sec., 42 min. 40 sec., and 43 min. 10 sec. (42½ min. net), representing gains of 3¾, 1¼, and 1½ min. on schedule. No. 252 did especially well with her tremendous train.

At Doncaster on the first occasion we added three eight-wheelers from Hull, making in all 400 tons net exactly, and

Digitized by Google

425 tons gross; on the second trip the Hull portion was detained for attachment to the following Leeds express, but two further eight-wheelers with military traffic brought us up to 17 bogies, 461 tons net, and 500 tons gross; on the third run we totalled 15 "eights" from Doncaster, 425 tons empty, and 460 tons full. Our engines were No. 272 on the first run, and two superheated "Atlantics," whose numbers I was not able to ascertain, on the other two. No. 272 started well, only falling to 40½ m.p.h. at Piper's Wood, and passing Bawtry, 8.3 miles, in 13 min. 20 sec., and Retford, 17.4 miles, in 23¼ min. Thence until well beyond Tuxford, however, we were troubled by the brakes leaking on, so that our subsequent maximum was only 62½ m.p.h., and the 18.5 miles from Retford to Newark took 22 min. 40 sec. Then at once followed a bad p.w. check, hampering the ascent to Stoke, so that our time from Newark to Grantham, 14.6 miles, was 21 min. 25 sec., with a minimum of 37½ m.p.h. at Peascliffe Tunnel, and from Grantham to Stoke, 5.4 miles, 8¼ min., with a final minimum of 34½ m.p.h. From Stoke we ran to Essendine, 11.5 miles, in 11 min. 5 sec., touching 74 m.p.h., and from Essendine into Peterborough, 12.2 miles, in 13 min., making a total of 99 min. 40 sec. from Doncaster, or about 94-95 min. net., which showed good work.

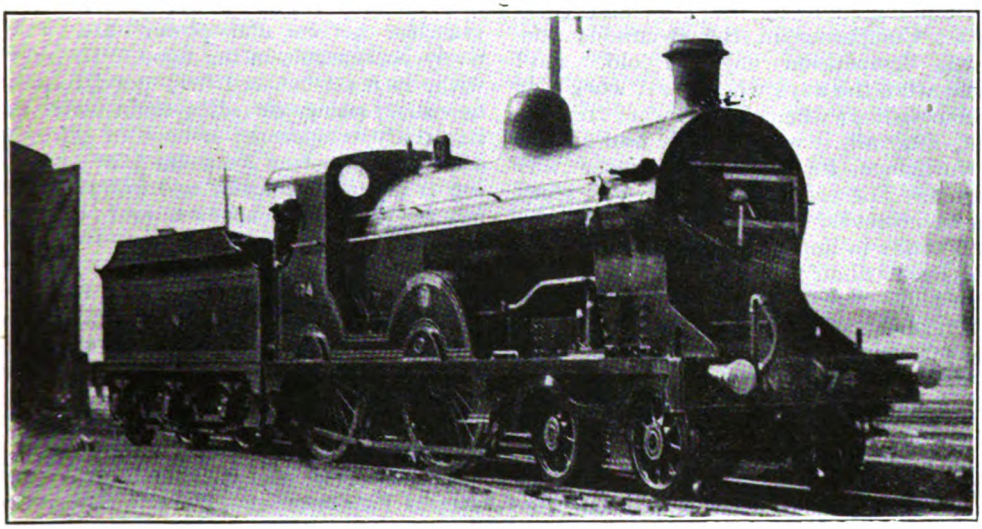
The superheater "Atlantic," with 500 tons, had a tough task, but did wonderfully well, and, fortunately, we were not checked anywhere. We passed Bawtry in 13 min. 35 sec. (falling to 36½ m.p.h. at Piper's Wood); Retford in 24 min. 40 sec.; Markham, 22.5 miles, in 32 min. 20 sec., at 31½ m.p.h.; Carlton, 29.6 miles, in 40 min. 5 sec., at 65 m.p.h.; Newark, 35.9 miles, in 46 min. 35 sec.; Grantham, 50.5 miles, in 66 min. 20 sec. (minimum at Peascliffe 34 m.p.h.); and Stoke, 55.9 miles, in 75¾ min., at exactly 30 m.p.h. From there we ran to Essendine in 11¼ min., sustaining 75 m.p.h. for some distance, and from Essendine to Peterborough in 11 min. 35 sec., maintaining 72½ m.p.h. as far as Helpston and 60 right on to Walton. Thus our gross time was 98 min. 35 sec., or practically exactly as booked. On the third run we were badly slacked for p.w. repairs at Retford, and so took 13½ min. from Doncaster to Bawtry, 23 min. 55 sec. to Retford, and 33 min. 50 sec. to Markham, but we ran smartly down Tuxford Bank, passing Carlton in 41 min. 40 sec. at 68 m.p.h., and Newark in 47 min. 40 sec. Then came a signal check to walking pace at Claypole, so that Newark to Grantham took 24 min. 25 sec., and Grantham to Stoke 9¾ min.; the Stoke-Essendine time was 13¼ min., with a top speed of 75 m.p.h., and that from Essendine to Peterborough 12 min. 5 sec. This made in all 105 min. 10 sec., but the net time did not exceed 96-97 min., and this with 460 tons. A tonnage of 460, indeed, was the average loading on these three trips, and the average net time of 96⅓ min. reflects credit on the drivers under such onerous conditions.

From Peterborough No. 272 ran through on the first occasion, and kept almost exact time, passing Huntingdon, 17.5 miles, in 26 min. 5 sec.; Sandy, 32.3 miles, in 41½ min.; Hitchin, 44.5 miles, in 57 min. 25 sec.; Knebworth, 51.4 miles, in 69 min.; Hatfield, 57.7 miles, in 77 min. 40 sec.; and Potters Bar, 62.7 miles, in 83½ min.; after this brake trouble recommenced, but we reached King's Cross in 98½ min., or 97⅓ min. net. Minima at Ripton and Stevenage were 32 and 31 m.p.h. respectively, and maximum at Offord and Hatfield 64 and 68 m.p.h. On the second journey only a non-superheater "Atlantic" had been provided at Peterborough to take us forward—No. 1408—and was no match for the huge trainload. So our time to Huntingdon was 29 min. 10 sec., to Hitchin 71 min. 20 sec., to Hatfield 85 min. 5 sec., and to King's Cross 108 min. 25 sec.—a loss of 10½ min. But on the last run we did well with our 460-ton train, hauled by a superheater "Atlantic," only falling to 37 m.p.h. at Ripton, 52 at St. Neot's, 29 at Stevenage, and 45½ at Potters Bar, while the maxima were 64 m.p.h. at Offord, 59 at Tempsford, 66 at Hatfield, and 69 at New Southgate. So we were through Huntingdon in 25 min., Sandy in 40 min. 35 sec., Hitchin in 55 min. 40 sec., Knebworth in 67 min. 25 sec., Hatfield in 75¾ min., Potters Bar in 81¾ min., and reached King's Cross in 96½ min.—1½ min. under schedule.

In conclusion, a run on the up day "Scotsman" is worth mentioning, as the

Digitized by Google

small "Atlantic," No. 982, now superheated, had to handle a load of 62 axles, 451 tons empty, and 490 tons with passengers and baggage. Out of Grantham the steep initial 5.4 miles to Stoke took 14¼ min., after which we ran on to Essendine in 11 min. 10 sec., sustaining a maximum rate of 77½ m.p.h., and from Essendine to Peterborough in 11 min. 25 sec., speed, as usual, being severely reduced through the latter station. Peterborough to Huntingdon occupied 25 min. 5 sec., with a minimum of 31 m.p.h. at Ripton; Huntingdon to Sandy, 15 min. 55 sec.; Sandy to Hitchin, 15 min. 40 sec.; Hitchin to Knebworth, 12¼ min. (the minimum at Stevenage being 27 m.p.h.); Knebworth to Hatfield, 8 min. 35 sec.; Hatfield to Potters Bar, 6 min. 10 sec.; and Potters Bar into King's Cross, 14½ min.; making up a total of exactly 2¼ hours, or 4 min. under the time of 139 min. allowed. From Peterborough we took 98 min. 10 sec. These may not seem in any way remarkable times—perhaps rather the reverse, in view of past records—but when it is realised that on the ten runs detailed the average axle-loading of each train was over 60, the average tare load 430 tons, and the average gross load 460 tons—at a very moderate estimate of passengers and luggage, in view of the increasing use of non-corridor stock—it is obviously necessary to revise altogether the basis of one's valuation of the times achieved. So far as these runs are concerned, I should consider the locomotive work embodied in them considerably superior to anything demanded by the Great Northern time-tables in the days before the war.



Photo] [*J. Macartney Robbins.*

GREAT NORTHERN RAILWAY (IRELAND).

4-4-0 superheater, No. 174, *Carrantoul.*

Digitized by Google

A Wonderful Railway Race.

By JNO. ORR.

THIS veracious story about a race has really nothing very exciting in it such as might be looked for in an account, for instance, of the great race from London to Aberdeen indulged in by the East and West Coast Companies in the strenuous and brave competition days of old. Ah! these were the days when great work was accomplished; when records were created. But, after all, it was a costly and useless performance, for no good purpose was served. The race about which this story deals, however, completely outstrips and transcends in importance the London and Aberdeen affair; it is, in fact, ten thousand times more valuable, because the results evolved out of it are of far greater consequence, advantageous and otherwise, to the Companies as well as to the industrial and commercial interests of the nation itself.

This race, between two competitors, viz., wagons and locomotives, is known in contemporary history as the race between "weight and power." It was started years ago, and is still going on. As a race, it is, of course, not nearly so stirring, certainly not so spectacular, as that referred to, and perhaps many of our readers will by this time have denounced the title of the article as a fraud, or, to put it more mildly, a misnomer; doubtless they expected a thrill and will be disappointed.

From time immemorial, dating, of course, according to railway chronological history, and not that of the Flood (what a difference it might have made had there been railways in those days!), there has been a constant struggle going on between these two. Railwaymen, traders and students of railway affairs—an important body—have taken a keen and lively interest in the progress of this competition, especially regarding the qualifications of the competitors. The locomotive has always been first favourite. This might be expected on many grounds, but the principal—the dominating reason—is one purely of sentiment, and we are bound to say this feeling is a compliment to ourselves, for the locomotive is "a thing of life." It is marvellous how, in the make and construction of the locomotive, the conditions and attributes of the human frame—body, constitution, muscles, nerves and power—are relatively comparable in the two. To begin with, it must be well fed; good food is essential; plenty of fresh, clean water; it is strictly temperate; a dose of oil now and again, just to keep its joints working freely; its stomach and bowels must not be allowed to become foul or congested; they require to be kept free and open. If there be one trouble it is subject to more than another, it is indigestion; its stomach and bowels must be carefully watched. It has also its delicate parts, akin to the lungs and valvular organ; it has its muscular and nerve centres (it has been known to take a fit of nerves and refuse to go, or to stop, which is worse). It is from these two it obtains its power of motion. The locomotive has a clear voice; sometimes a tenor, sometimes a deep bass; it can speak quite intelligently to the signalmen as it sweeps along, telling them on which line it wishes to travel, especially at cross-roads, where there are many to choose. If the signalman has made a mistake and puts it on the wrong road, it will stop, and refuse to "take the wrong turning," an obvious moral. It is a most obedient servant when all its reasonable requirements are attended to; the power can be applied so gently as to give an almost imperceptible motion to its limbs (whether coupled four, six or eight); but when it puts forth its full strength and great power it is indeed a mighty, an inspiring sight!—a sight for "Jove" himself.

The locomotive breathes as it goes along; but when the load is heavy, as it usually is, it breathes very hard, especially when it is old, or when going up a hill; sometimes it is sorely distressed, and can scarcely catch its breath; then, again, if it slips on a wet road, it coughs

Digitized by Google

badly. When it gets very old, it takes asthma, a trouble common to all locomotives, as well as many humans; and this affliction usually carries it off in the end: "sic transit." Doubtless it is due entirely to, shall we say? its physiological nature that we have all such respect, such pride—in fact, a strong sympathetic feeling for this mighty, magnificent creature (we refuse to write creation). It is, therefore, with profound sorrow we have to record it was defeated unfairly in the great race we set out to describe. The locomotive was beaten by the wagons, but that only by "sheer weight of numbers" (an ominous expression used by war correspondents, alas! too often at present, with dreadful significance); the wagons were piled on, and ever on, until the locomotive was absolutely overpowered. The wagons, although never at any time things of beauty (utility and beauty seldom combine well in wagons, although present in a remarkable degree in the locomotive), do not improve in appearance, and they have unquestionably been found wanting in utility. To watch a mineral train pass through a station is to give the æsthetic spectator a shock with the belief that the system, as well as the scheme of designing and decoration, should at once be placed under properly constituted and intelligent control. The wagons are an amazing variety of sorts and sizes; they are painted all the colours of the rainbow, and colours not to be found in that sublime arch; each Company and trader have a colour scheme of their own, some apparently have two or three schemes, and the result, with the huge lettering on the sides, is more after that of a travelling circus outfit—one that has apparently fallen on evil days—than the property of a respectable Railway Company or trader. The trader is certainly the worst offender; perhaps the colour scheme is a sort of camouflage to cover up the shortcomings of the wagon itself. This is a great age! No wonder the locomotive is ashamed to be seen connected to such a crowd, and insists on wagons and vans being supplied worthy of its power. It will be pretty obvious to the reader by this time that wagons and locomotives are great rivals; there has been a constant struggle between them for supremacy. The wagons rather fancy themselves; they say: "We earn all the revenue of our great goods and mineral departments by the work we perform; we carry the huge volume of traffic on which the revenue is earned; we claim to be the best servants the Company has, because you will admit the revenue is the very life of the Company itself." "To hear you speak, one would imagine you were the only one working on the line," replied the locomotive. "Allow me to tell you there are many others beside you all doing their bit and saying less about it. You are only a box on wheels, anyway, not very much larger than your great-grandfather was 50 years ago. You claim to carry 8 or 10 or perhaps 12 tons, but when put to the test you shout out, 'Full up!' when there are only about 2 tons 10 cwt. or 3 tons put on to you. Why! that's simply a miserable load of merchandise to carry, especially by one making such pretensions! What we locomotives want is a decent wagon, one that'll carry the load of half-a-dozen of your sort; our strength is absolutely wasted on you. We could haul twice the weight of merchandise in suitable wagons, earning twice the revenue for our Company, if we could get the chance; but you, you miserable little fraud! are the cause of all the trouble and unprofitable working on the British railways to-day. You seem to have been an unfortunate creature of circumstances all your life; you have not been allowed to grow or develop properly as wagons have in other countries, though why, I'm sure I don't know." Without allowing the wagon time to reply the locomotive continued: "In spite of your limited capacity for work, you are suffering from a severe attack of swelled head. In my opinion, and it is a pretty general one now, you have been found out for what you are worth, and that is, you cannot do the work you pretend to do. Your great fault is your lack of capacity, which we now know to be the one essential, the *sine qua non,* of a goods or mineral wagon for revenue-earning purposes. You are strong enough, in all conscience, but you are too heavy for your size; you are positively lazy; more than half your time is spent loafing about lyes. When actually carrying a load I have to get a hold of you and pull you along from place to

Digitized by Google

place, or you would never get there yourself. At some stations I have to manœuvre round you and push you gently into the goods shed, or place you in a siding. Every movement has to be controlled by me; you are never so safe as when I have a hold of you. If by any chance you happen to get away on your own, what is the result? There is sometimes not much left of you to tell the tale." This rather acrimonious discussion might have been continued for some time, but the locomotive was signalled forward with a heavy train, leaving the wagon in the siding, feeling rather limp after such a castigation.

But the moral of the story is obvious; wagons and locomotives are not working in harmony; they are completely out of proportion to each other; the great revenue-earning power of the latter is practically neutralised by the excessive tare weight and limited cubical capacity of the former. The evolution of the ordinary wagon from 3 tons to 8 tons capacity took exactly 30 years, increasing 1 ton each time, and it took another 20 years to reach the present maximum of 12 tons for goods and 16 tons for mineral wagons, advancing 2 tons each time. These are the figures of most Companies; there are, of course, exceptions. The policy pursued cannot be described as a bold one, but surely it has been, if anything, over-cautious. Never at any time has the ordinary type of wagon been so severely tested and its value for revenue-earning purposes been less than it is at the present time. The solution is the high-capacity wagon, which, with its moderate tare weight to its large carrying capacity, is admirably adapted for the regular heavy and bulky merchandise traffic moving daily between long-distant points all over the country, as well as for many other purposes; it is a great revenue-earner. The system for working the high-capacity wagon is not necessarily a great change; there will be greater changes yet! But I hear someone ask: "What about the race you promised to describe?" Oh, well! like Artemus Ward, when taken to task for not sticking to his subject, what is the use of a description when you can see the real thing yourself? The race is run every day, Sundays included at present, and can be seen from any main line station platform. When you see two heavy trains passing at short intervals, both going the same way, say, London to Glasgow, or between other important centres, then you have seen the great race, and also how the wagons won, because, had the merchandise been stowed in proper high-capacity wagons, there would have been but one train. Verb. sap!

Digitized by Google

King's Birthday Honour for the London and North Western Railway General Manager.

SIR GUY CALTHROP, Bart.,
Controller of Coal Mines, Board of Trade.

WHILE throughout the British railway world general satisfaction was expressed on the announcement that H.M. the King had honoured with a baronetcy, Mr. Guy Calthrop, general manager, London and North Western Railway, the news at the company's headquarters at Euston, and all over the system, was received with enthusiasm. In February, 1917, Sir Guy, was placed by the British Government in control of Coal Mines, and in his absence from the railway, his duties of general manager are being performed by Mr. I. T. Williams. As Controller of Coal Mines, Sir Guy has been an unqualified success. During the last winter, London and the South of England in particular, felt the benefit of his wise administration. Born in Uppingham in 1870, Sir Guy began his experience on the London and North Western Railway in 1886. He advanced in the service until in 1901 he became assistant to the general manager. Then he went to the Caledonian Railway, first as general superintendent and afterwards as general manager. This experience was followed by his appointment as general manager of the Buenos Ayres and Pacific Railway, but this was relinquished to take up, on October 1st, 1914, the supreme executive position on the London and North Western Railway. In 1916, Sir Guy Calthrop was added to His Majesty's Lieutenancy of the City of London.

Digitized by Google

RAILWAYMEN'S FLAG DAY.

Photo] A FLAG SELLER DECORATING A FELLOW-WORKER. [*Topical.*

A FLAG DAY, organised by the Railway Benevolent Institution in aid of its Diamond Jubilee, was held on Tuesday, June 11th, with every indication—so far as the metropolis was concerned—of a substantial success. All engaged worked well, and some of the London sellers disposed of their stocks several times over during the day. The staff of the Underground Railways made special efforts to ensure good collections on their lines. Between 500 and 600 of the female staff and their friends volunteered to assist in selling flags, and the whole of the collectors were equipped with trays easily identifiable with the Underground Railways. The photograph reproduced on this page was taken outside St. James's Park Station, S.W. Where the staffs of all railways worked with such good will it would be invidious to make comparisons, but special mention should be made of the South Eastern and Chatham Railway. Sir Francis H. Dent, the General Manager, is this year Chairman of the Board of Management of the Railway Benevolent Institution, and this probably accounts for the extraordinary enthusiasm shown by the employees of this southern line.

Digitized by Google

Government Control of Railways in War Time.

I.—THE UNITED STATES.

By VERNON SOMMERFIELD.

IN the welter of war, and for reasons directly connected with the war, the greatest experiment which has ever been made, not only in the Government control of railways, but in the Government control of any public service, is at present being conducted in the United States. That is the significance of President Wilson's historic assumption of control of the American railroads, whose importance is but imperfectly appreciated on this side of the Atlantic, and, perhaps, on the other side as well.

On America's entry into the war, the United States railroads originally established the Railroads' War Board, an organisation which can loosely, but only loosely, be compared with our own Railway Executive Committee. Under this Board, which was composed of the foremost railwaymen in the United States, the country was divided for traffic purposes into seven districts. The Board's governing principle was that of securing the maximum of co-operation among the individual systems, so that the normal commercial rivalries between different companies might give place to an arrangement whereby the lines should be operated without thought of ownership, and with a sole view to the most efficient prosecution of the war. It can at once be said that the Railroads' Board did its work well, and proved again how much there is to be said for the principle of control by practical experts as compared with Government officials.

The organisation set up on the assumption of Government control, after a brief interregnum during which a temporary arrangement was adopted, is headed by the Director-General of Railroads, Mr. William G. McAdoo. Immediately under him are three regional directors—as against the seven districts administered by the Railroads' War Board—and each of these directors has established its own organisation. Subordinate to the Director-General are also directors of divisions of finance and purchases, transportation, traffic, capital expenditure, labour and public service and accounting, a general assistant, and a general council. Each of these departments has also built up its own organisation, while, in addition, numerous special committees have been appointed to carry out special investigations.

The obvious criticism aroused by such an arrangement is that it involves excessive centralisation, an inherent feature of Government administration or control, of which the Ministry of Munitions is a striking example. And American critics are asking whether centralisation has not been carried to excessive lengths. The three regions into which the country is divided are the Southern, with 51,000 miles of railway; the Eastern, with 66,000 miles; and the Western, with the enormous total of 144,000 miles. On no previous occasion has the entire operating control of anything like 50,000 miles, let alone 144,000 miles, been entrusted to a single administrative organisation. Even the systems of 5,000 to 10,000 miles normally operated by a single one of the large American companies have often presented the most complex administrative problems, and have, incidentally, proved undue centralisation to be a mistake. Now, the entire United States system of 260,000 miles is under the control of a single Director-General, and a wide host of matters usually settled by the officers of individual companies has to be submitted to Washington daily.

Now, centralisation is, of course, neither bad nor good in itself, although certain disadvantageous conditions will inevitably result if the process be carried out to excess. And one is, perhaps, right

Digitized by Google

in assuming that the existing system of American organisation has not reached finality. But no one has ever wielded such extraordinary wide powers over so colossal a railway territory as are vested in Mr. McAdoo, as will be seen from the following cursory summary of his activities to date.

One of the very first steps taken by the Director-General was to issue immediate orders to the railroads to "disregard competitive conditions," and move all goods traffic by the shortest routes available. Drastic reductions were made in the passenger service, affecting the short-distance traffic as well as the long-distance expresses. Demurrage rates were increased to a very appreciable extent, and, in addition, instructions were issued to embargo consignors and consignees who did not load and unload freight cars quickly. On some of the principal Eastern lines, embargoes were placed on the transportation of practically all goods traffic save food, munitions, and fuel, while the principle of local embargoes was largely adopted on other lines.

It will at once be conceded that these arrangements, all of which have been adopted by other belligerent countries, are desirable and necessary. But, as will have been gathered from the preceding remarks, American expert opinion is by no means unanimous in regard to the desirability of investing such very wide powers in such few hands, while the enormous centralisation at Washington has come in for very much criticism. And it must be admitted that the desirability of some of the Director-General's powers is distinctly open to question.

For instance, there is a recently-established Division of Capital Expenditures of the Railroad Administration, which investigates and decides on all proposals made by the railways in regard to improvements. In addition, the companies may be required to undertake new works or improvements which would not otherwise be necessary or justifiable, but which may be regarded as desirable from the standpoint of the war-time policy of working all the railways as one system.

On the face of it, this last power seems logical, necessary, and desirable. But we must guard against the common error of regarding American railway problems from the same point of view as that from which we should consider British or Continental railway affairs. For many years past, the financial position of the American railroads has been unfavourable. Rates and charges have been too low to permit of an adequate return on railway investments, with the result that sufficient capital has not been forthcoming either for improvements, extensions, and new works in general, or for the provision of the number of locomotives and freight cars necessary to handle the traffic during the periods of highest pressure. Incidentally, this lack of facilities has seriously hampered the war-time operation of the railways. Even under normal conditions, the future and the financial prosperity of the American railways would depend greatly on the developments of the next few years. With freedom in the matter of making capital expenditures taken out of the companies' hands, with no powers to undertake new works which they may consider necessary, and with the possibility of being compelled to undertake quite unremunerative works, Government control may easily jeopardise the future of the American railroads, with which the prosperity of the whole of the United States is so closely bound up. That possibility will obviously not be lessened by the extraordinary degree of centralisation now prevailing.

For the process of centralisation has been carried to quite extraordinary lengths. Under the terms of the financial arrangement adopted, the Government pays each individual company a certain fixed sum for the use of its properties, and itself collects the revenue and pays the expenses. Such financial control presupposes control over operation, and, in addition, as already mentioned, there is the most complete administrative control. One detail of this latter is especially illuminating. The financial and corporate organisation of the companies as such is so separated from all connection with operation and properties, that railroad officers appointed to positions in the Government railway organisation are obliged to resign all connection with their companies. This is tantamount to a system under which the general manager of the London and South-Western Railway, for instance, would be obliged to sever all connection with that company because he was a member of the Railway

Digitized by Google

Executive Committee. In other words, the American organisation transforms a railway officer into a Government official, and, human nature being what it is, the danger arises that the practical expert may be converted into the bureaucrat.

Another instance may be given of the extent to which the United States Government controls the details of railway operation and administration. Apart from its powers over capital expenditure —powers both restrictive and compulsory, it exerts very considerable control over revenue expenditure as well. Thus railway advertising has already been restricted, as well as the activities of canvassing agents. The purchase of locomotives and and rolling stock is also subject to sanction from Washington; indeed, official permission is necessary for the purchase of any stores, material, or plant of any kind involving an outlay in excess of £10,000.

This power over purchases has been very severely criticised in the United States. The American railroads, in the aggregate, form the largest buying concerns in the world, their annual purchases amounting to colossal sums. They are the largest purchasers in existence of locomotives, rolling stock, rails, and structural steel and the like, the largest buyers of coal, and probably the largest purchasers of such miscellaneous commodities as stationery, lubricating oils, paints, and a whole host of manufactured and semi-manufactured articles and raw materials. Criticism against the Government's powers of purchase have mainly been based on the political "pull" which can be excited by any organisation able to buy in such immense quantities. That objection is mainly directed against potential dangers, but there are obvious disadvantages in a system under which authority to make necessary purchases for over a quarter-of-a-million miles of railway have to be referred to a central Government Department.

One of the latest activities of Government control in the United States is the scheme for standardisation of locomotives and freight cars. This standardisation, especially in regard to locomotives, has been criticised on technical grounds into which it is unnecessary to enter here. Mention may, however, be made of an objection, that while the standard designs are being elaborated and the necessary templates, etc., made, time will be lost in the construction of much-needed locomotives of existing types.

The above does not profess to be more than a very brief summary of the American organisation. The criticisms here expressed are not so much the writer's own as those of American railway experts, although he endorses all the objections to excessive centralisation which have been uttered on the other side of the Atlantic. Time is needed before one can pronounce on the success or otherwise of Government control, but it seems clear that the British system of leaving railway working and management in the hands of practical experts, who are unfettered in matters of detail, is more likely to produce the best results than the American method of superseding railwaymen by Government officials, and adopting a degree of centralisation under which points of detail are settled at Washington instead of in the offices of the individual companies. That would also seem to be the opinion of many American railway experts and business men.

(To be continued.)

Digitized by Google

The Barry Railway:

Its Growth and Enterprise.

THE BARRY RAILWAY CHIEF OFFICES.

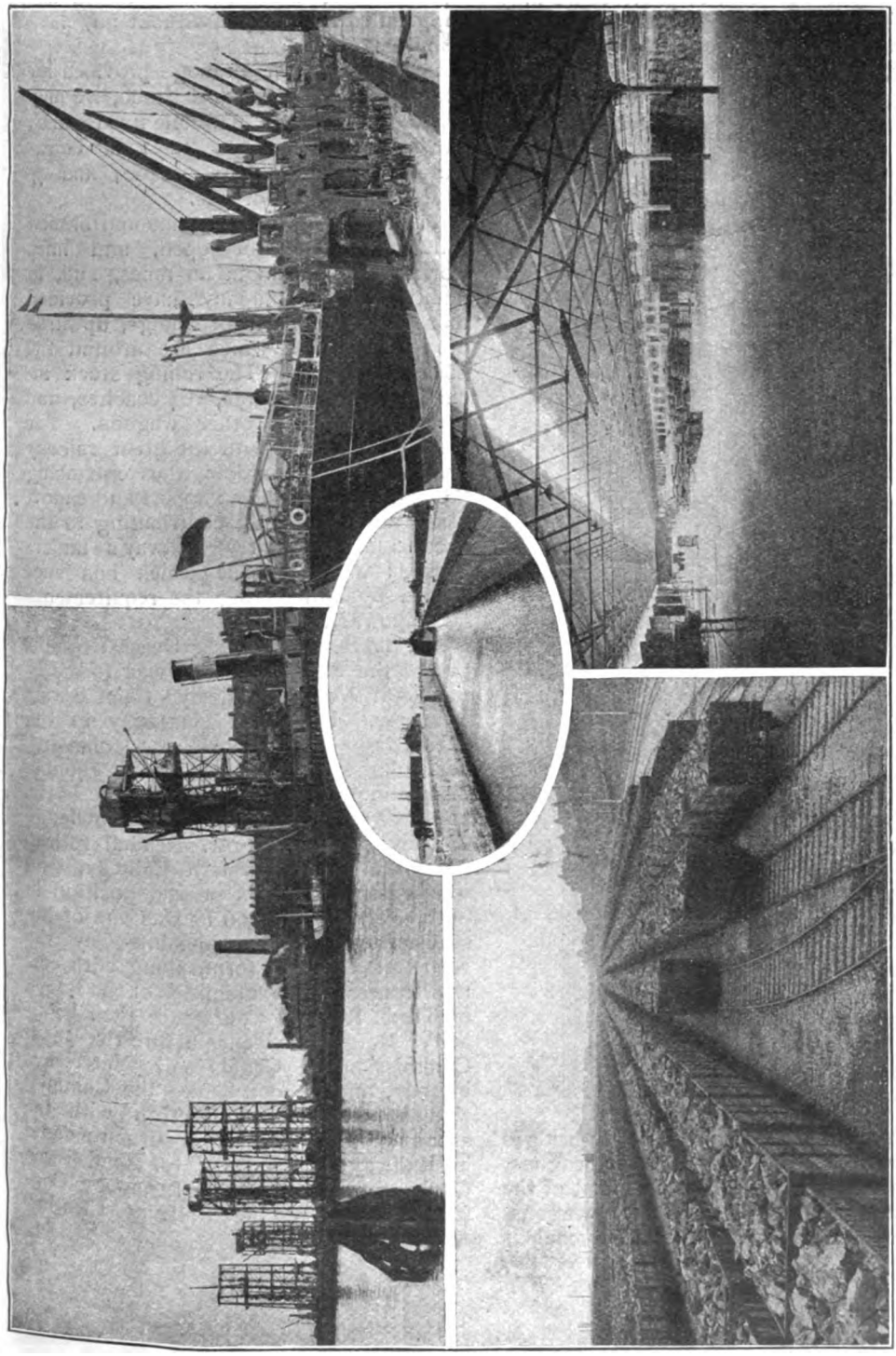
A GLANCE at the map shows that the geographical position of the Barry Railway is one which invests it with unique advantages. Situated, as it is, at the centre of the northern shores of the Bristol Channel, the shipping using the docks have easy access to the open ocean, while the rich coalfields of the hinterland ensure that abundance of coal necessary to make it a first-class bunkering port and a leading centre of coal export activities. These natural advantages have certainly been made the most of by the Company's influential and enterprising directorate.

The first of the Barry Docks was opened no longer ago than 1889, and during that year the total exports and imports amounted to the somewhat modest total of 1,160,402 tons. During 1914, however, this total increased tenfold, giving an aggregate import and export trade of 11,572,373 tons. In the first year mentioned the total number of ships using the dock numbered 598, of 567,958 tons, while during the year ended December 31st, 1914, the number of ships arriving was 3,456, and their registered tonnage 5,061,869. These are evidences of growth which can hardly be surpassed in the records of any other port; and they furnish a crystallised proof of the enterprise of the Company in providing not only accommodation for shipping in the way of docks, but also of cargo and bunkers and up-to-date methods for their manipulation. The docks, whose area is 114 acres, exclusive of 41 acres of timber dock accommodation, are of easy exit and entrance.

The equipment of the Barry Docks includes three large dry docks, two of which can accommodate four large vessels at the same time, while the Barry Graving Dock Company's single dock is capable of accommodating the largest merchant vessel afloat. Provision has also been made for the docking and undocking of vessels of all kinds almost continuously by means of the Low Water Lock, the only lock of its kind in the Bristol Channel, a work justly described as one of "national importance." Vessels can, therefore, enter the docks with the least possible loss of time.

Needless to say, this excellent water accommodation is splendidly equipped with the most modern plant for loading or discharging cargoes. The coal hoists are arranged to give the greatest possible despatch in the shipment of coals, combined with adequate provision for the prevention of breakage and for the screening and weighing of coal for shipment. In this connection we may point out that the directorate have ever adopted a progressive attitude, and the capital facilities have recently been further supplemented by three fixed and two movable coal tips erected in No. 1 Dock. These are capable of lifting wagons 60 ft. from the quay level, thus enabling the largest type of vessels to take in their bunker coal or other coal with the utmost celerity.

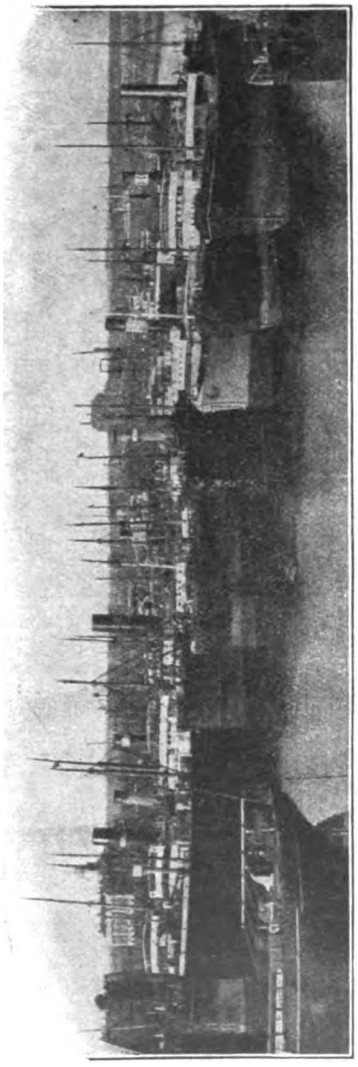
Digitized by Google



1.—New coal tips in course of construction. 2.—Seven cranes at work on a steamer, discharging nitrate into transit shed. 3.—Vessel entering deep-water lock. 4.—Storage sidings for coal awaiting shipment. 5.—Interior view of transit shed.

Digitized by Google

As showing the excellent despatch the Company are enabled to provide, we may cite the case of the s.s. *Knightsgarth*, which loaded 4,021 tons of coal in 6½ hours, a rate of shipment which works out at 619 tons per hour. Two weigh-bridges are provided, one for the loaded wagons, which are weighed before shipment of the coal, and the other for the empty wagons, which are weighed after the coal is shipped. The actual weight of the coal is, therefore, definitely ascertained and supplied to the shipper without any additional charge.



VESSELS IN TIER IN BARRY DOCK.

Included in the cranage provided for dealing with merchandise traffic, we may mention one 50-ton hydraulic fixed crane; travelling cranes from 12 tons downwards; a steam floating crane; and 47 hydraulic movable cranes.

The length of the main line and branch railways at present open, and lines worked over, is about 88 miles, and, in addition, the Company have provided more than 160 miles of sidings, upwards of 100 miles of which are around the docks at Barry. The rolling stock includes 148 locomotives, 184 coaches, and 2,136 goods and other wagons. The system is linked with the great railway arteries of the kingdom, thus enhancing the value of Barry as an import and export centre and materially contributing to the success of the Barry Railway's undertaking: an enterprise which has succeeded by anticipating the requirements of shipowners.

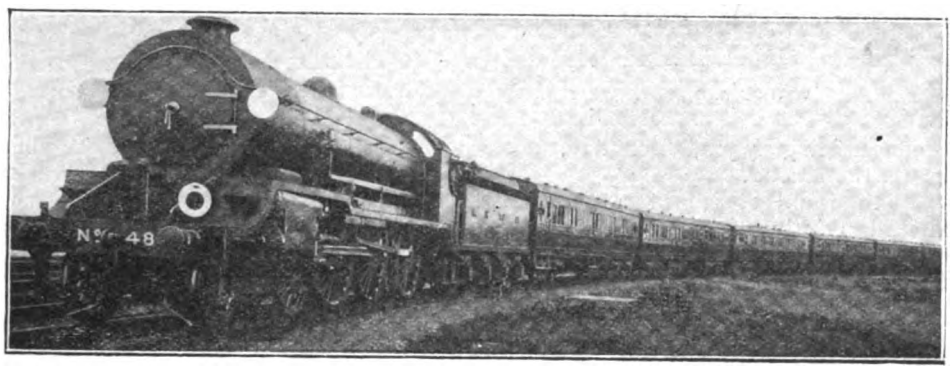
Mr. T. H. Rendell, the General Manager of the Barry Railway, was formerly the Great Western Railway's Chief Goods Manager. From his biography in the "Railway Year Book," the following particulars are gleaned: "Of equable disposition and sound judgment, he is the possessor of a comprehensive knowledge of railway affairs. Mr. Rendell retired from the Great Western Railway, and was appointed to his present position in March, 1912. In 1906 he was one of the six railway officers appointed by the Board of Trade to form, along with certain traders, a sub-committee of the Board of Trade Railway Conference then being held. He gave evidence before the Royal Commission on Canals and Waterways in 1907, and in 1908 before the Commission appointed in connection with the accounts and statistical returns rendered by Railway Companies. Mr. Rendell was Chairman of the Goods Managers' Conferences also at the Railway Clearing House for 1908."

Digitized by Google

United States Ambulance Train, No. 62.

Built by London and South Western Railway.

A SPLENDID example of reconstruction work stands to the credit of the Carriage and Wagon Department of the London and South Western Railway. From ordinary South Western stock one of the finest ambulance trains in existence has been evolved, eliciting the praise of the American Government, for whom it has been made, and of thousands of the British public who were given an opportunity of inspecting it before its shipment to France for the use of the American Armies. And well might satisfaction be expressed at Eastleigh's workmanship, for everything that human ingenuity can devise for the safe and comfortable transport of the wounded has been provided.



U.S. AMBULANCE TRAIN 62 LEAVING EASTLEIGH WORKS.

The train is painted khaki-green, with the Red Cross and initials "U.S." figuring prominently on the sides of each vehicle. It consists of 16 vehicles, weighs over 440 tons when empty, and accommodates ordinarily 418 persons, or when its bottom beds in the wards are converted into seats, a maximum of 680 patients and staff.

Among the items of special equipment are Westinghouse brake, screw hand brakes, passenger chain communication, international screw couplings, direct steam-heating from engine, electric lighting, electric fans, tool boxes, fire extinguishers. The wheels are of special "steel disc" design, and special footboards and boarding ladders are provided. The important matter of ventilation has likewise received most careful attention.

It may be observed that the numbering of each car indicates the train to which it belongs, and its order in that train. For example, the first vehicle is No. 6201, indicating train 62, first coach. The kitchen and mess room is No. 6214, indicating that it is the fourteenth vehicle of train 62. By this method, should any of the vehicles be detached for repairs or any other purpose it can readily be restored to its proper position on its own train.

After the official inspection of the train by the American representatives, the General Manager, Sir Herbert Walker, K.C.B., arranged for the train to be placed on view for four days at Waterloo Station, London, one day at Kingston, and two days at Bournemouth West. A charge of 8d. was made to the general public, and of 4d. to members of the Forces and the railway staff. The daily attendance at Waterloo was 2,263, 2,984, 4,050, and 2,929 respectively. Among the

Digitized by Google

visitors were Princess Victoria Louise and Mrs. Whitelaw Reid, wife of the American Ambassador. At Kingston, Waterloo's record day was beaten, the attendance there being 4,207. Bournemouth West surpassed Kingston, the attendance being 4,502, first day, and 4,740 on the second.

Nine thousand copies of a souvenir booklet, descriptive of the train were sold. The collection boxes placed on the train realised over £100. Altogether, in the week a sum of nearly £1,000 was raised for distribution to the London and South Western Railway Servants' Orphanage, St. Dunstan's Hostel for Blinded Soldiers, the St. John Ambulance Association, and the Fund for providing comforts for railway troops. Most willing assistance was rendered by the various Departments, the Station staffs and members of the South Western Centre of the St. John Ambulance Association to make the exhibition a success.

LONDON AND SOUTH WESTERN RAILWAY STAFF IN CHARGE OF EXHIBITION.

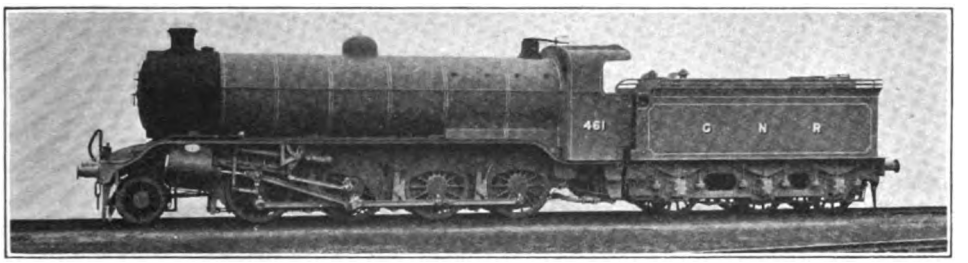
You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

Digitized by Google

Great Northern Railway: New Three-Cylinder Coal Engine.

FROM photographs and particulars supplied through the courtesy of Mr. H. N. Gresley, locomotive engineer, Great Northern Railway, the RAILWAY MAGAZINE is able to illustrate and describe a new 2-8-0 type locomotive, the construction of which has been completed at Doncaster Works recently.

Intended for working heavy coal trains between Peterborough and London, the distinguishing feature of this locomotive is the use of three 18 in. by 26 in. cylinders in conjunction with a special arrangement of valve gearing. The previous five engines of the 2-8-0 type introduced by Mr. Gresley on the Great Northern Railway for working the class of traffic referred to, have two outside cylinders only, measuring 21 in. by 28 in., driving the third pair of coupled wheels.



GREAT NORTHERN RAILWAY NEW 3-CYLINDER COAL ENGINE, NO. 461.

In the new locomotive to which reference is now made, the third cylinder is located between the frames driving the crank axle of the second pair of coupled wheels, whilst the outside cylinders also drive on crank pins set in the same pair of wheels. This arrangement permits of all three connecting rods being of the same length. Superheated steam is distributed to the cylinders by means of two sets of Walschaerts valve gearing outside the frames. The piston valves of the outside cylinders are placed above and at a somewhat shorter distance between centres than the cylinders themselves, whilst the inside piston valve is at the side of the cylinder to the left hand. The centre cylinder is cast in one with its valve chest and the smokebox saddle, each outside cylinder and valve chest being cast separately and bolted to the main casting. The arrangement of valve gearing for this engine has been made the subject of a patented invention by Mr. Gresley.

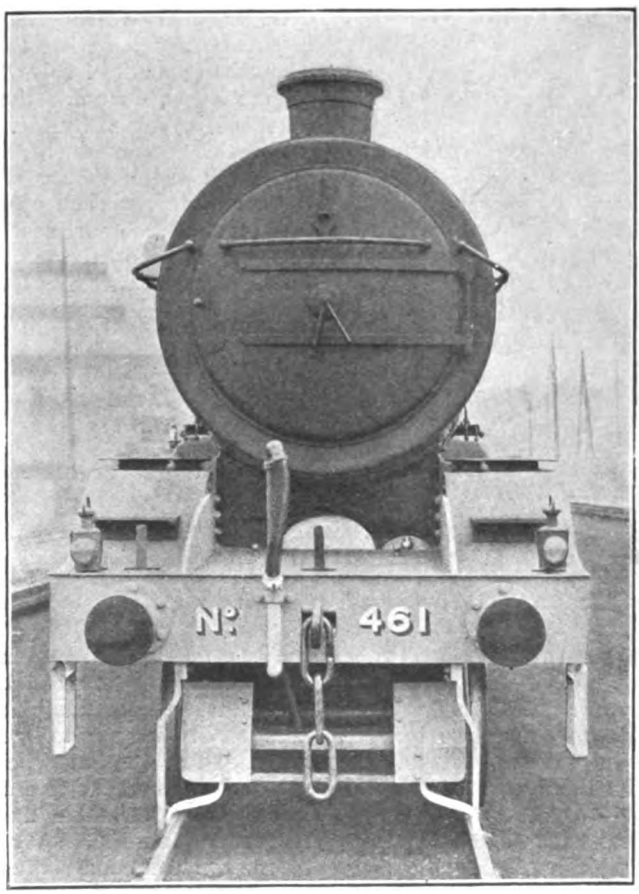
By this arrangement, although there are three piston valves of the ordinary pattern, one for each cylinder, only two sets of valve gear are required. The piston valve of the middle cylinder is operated by a system of levers direct from the two outside valve gears. In its simplest form, that is when the three piston valves are in the same plane, Mr. Gresley uses only two levers to operate the central valve. To one of the outside valve spindles is attached to a 2-to-1 horizontal lever working about a fixed fulcrum, the longer end of this lever being attached to the valve spindle; the shorter end is attached by a pin to the centre of the second lever, the ends of which are attached to the other outside and centre valve spindles respectively. This second lever has, therefore, a moving fulcrum. By this simple arrangement the movements of the outside valve gears are correctly reproduced and timed for operating the central valve for all positions of cut-off both in forward and backward gear. In fact, there is no more mechanism required for operating the central valve of a three-cylinder engine than there is for a four-cylinder engine

Digitized by Google

which has two valve gears only. One of the principal points in favour of the four-cylinder simple engine when compared with the three-cylinder simple has been that only two valve gears are required as against three, but by Mr. Gresley's invention this objection is now removed. Owing to the inclination of the cylinders of the engine under consideration it was not possible to arrange for the valves to be above the centre cylinder, the valve gear is therefore not quite so simple, and instead of horizontal levers operated directly from the outside cylinders, vertical levers are used and worked from motion shafts connected to the Walschaerts valve gears.

One of our illustrations shows the valve gearing of an outside cylinder in closer detail, also the attachment of the combination lever to the motion shaft from which the valves of the outside and the middle cylinders are operated. The slide bar arrangement consists of three bars, one at the top 7½ in. wide and two at the bottom, each 2½ in. wide. This arrangement provides very ample bearing surface for engines running in forward gear, and also considerably reduces the weight of the crossheads. The cylinders are inclined at 1 in 8, and the distance between the centre of the driving axle and the centre of the cylinders is 11 ft. 3 in. The connecting rods have a length of 7 ft. between centres. Mr. Gresley uses the same type of two-wheel truck in this engine as that employed on the previous ones and also on the 2-6-0 type locomotives of his design.

The boiler is identical with those of the

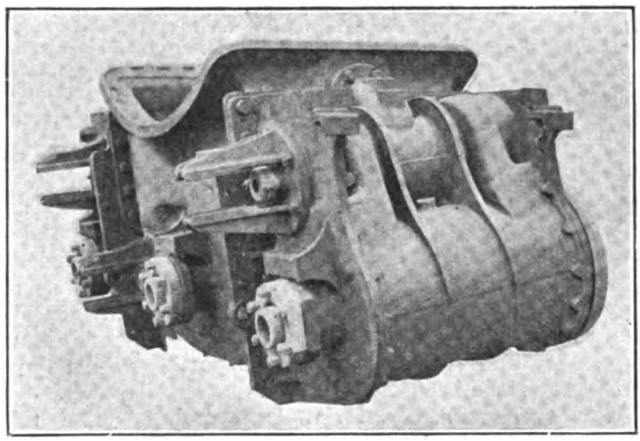


FRONT END VIEW OF NEW 3-CYLINDER COAL ENGINE, NO. 461, GREAT NORTHERN RAILWAY.

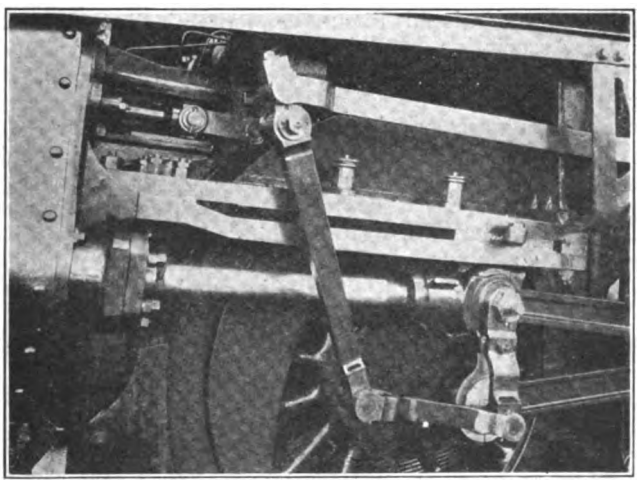
Digitized by Google

two-cylinder locomotives of the same general type. The length between tube plates is 15 ft. and the diameter outside next the firebox 5 ft. 6 in. The boiler is set with its centre 8 ft. 7¼ in. above the rails. It contains a 24-element Robinson superheater and 167 2-in. ordinary fire tubes. The engine is equipped with Wakefield mechanical lubricators for cylinders, valves and axleboxes.

The utilisation of a third cylinder improves the starting effort of a locomotive, and permits of a greater cylinder volume being reached without involving the use of any very heavy individual moving parts. The crank pins are arranged relatively to one another at an angle of 120 deg., and the turning moment of the crank axle is thus a favourable one. The engine should prove steady in running and capable of dealing with the heavy train loads imposed in a thoroughly satisfactory manner. The tractive effort of the engine at 85 per cent. boiler pressure is 32,605 lb., compared with 31,862 lb. of the two-cylinder 2-8-0 type on the Great Northern Railway, the coupled wheel diameter and boiler being the same. The new engine weighs 76 tons 8 cwt. in working order without tender, and of this 66 tons 12 cwt. rank for adhesion. This latest design of Mr. Gresley's is one of the most notable from the point of view of locomotive practice that he has yet introduced, and its performance will be watched with considerable interest by those responsible for the handling of heavy coal traffic on British railways.



CYLINDERS AND SMOKEBOX SADDLE.



VALVE GEAR AND MOTION DETAILS, 2-8-0 TYPE ENGINE, GREAT NORTHEN RAILWAY.

Digitized by Google

The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Before asking for information concerning railway history and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," a new edition of which has just been published, price 5s. net. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

Atmospheric Railway at Wormwood Scrubs.

An article by the late Mr. D. T. Shearman (*South Eastern and Chatham Railway*) appeared in the RAILWAY MAGAZINE, May and June, 1909. These parts have long since been out of print.

Our contributor, Mr. H. L. Hopwood, directs attention to an article in the "Engineer," December 27th, 1901, entitled "An Early London Railway," and the following is an extract therefrom: . . . perhaps the most interesting event in the history of this small line (West London) is its connection with the first practical trials of the atmospheric system. Mr. Henry Pincus, its inventor, had, in 1837, formed a National Pneumatic Railway Association, which arranged with the Thames Junction Company for a trial upon half-a-mile of its line when the works were sufficiently advanced. If the result was good, the Company were to work the whole line on this system, free of charge. Experiments on a short line alongside the Kensington Canal in 1837 ended in failure, but in 1840, Clegg and Samuda's improved method were laid on half-a-mile somewhere between Uxbridge Road and the G.W. Railway.

From Samuda Bros.' report, dated June 18th, 1840, it seems the experiments began on June 11th, and were continued on Mondays and Thursdays from 3 till 5 for a little while, and later on at irregular intervals. The air pump was 37½ in. in diameter with 22½ in. stroke, worked by a 16-h.p. condensing engine. Only a single line, with posts to mark every two chains, was provided, the gradient rising northwards 1 in 120 and 1 in 115. A table of the speeds and loads on June 11th and 15th, 1840, compiled by Mr. Hensman, of Waltham Abbey Powder Mills, shows that the maximum load taken was 11½ tons at 22½ m.p.h., whilst 30 miles was got with 5 tons 9 cwt.

The tube was only 9 in. in diameter, the pipes not being bored inside, but lined with a coat of pressed tallow, 1-10 in. thick, to diminish the friction of the piston.

On Monday, June 29th, 1840, the late Prince Albert witnessed the trials, and was greatly interested. A vacuum of 18 in. of mercury was obtained with 1½ to 2 minutes pumping, the gauges at each end practically corresponding. Forty to 42 strokes per minute were usually made by the pump, but owing to insufficient boiler power, this fell off towards the end of the run. There is no doubt higher speed could have been got on a longer and larger tube, as was proved elsewhere later on. The line was laid "in a rough and irregular manner" with some of the original rails from the Liverpool and Manchester Railway. About 1843 the plant was removed by Samuda's people, "who were rather unwilling to quit the line."

[Reply to A. F. LEATHER.]

A Point of Law.

Since you forwarded your question you may have seen the report in the newspapers of the case of Mr. L. G. Jones, solicitor, of Hatfield, who appealed from a County Court decision in favour of the Great Northern Railway. Appellant travelled from Cambridge with a first-class ticket in a first-class compartment. At Baldock passengers were told by a

Digitized by Google

porter to get in anywhere. Seven got into the compartment in which Mr. Jones sat. He claimed 4s. 6d., the difference between first and third class fares from Cambridge to Hatfield, which the Company refused to refund, and the County Court supported the railway's attitude. At the King's Bench Division, where the appeal was heard, it was decided that a first-class passenger, who is denied the comfort for which he has paid, is not—in war time—entitled to recover the difference between first and third class fares. Mr. Justice Avory, in giving judgment, said there was no breach of contract. The Company had done the best they could under present conditions. The passenger's contract was affected by the inability of the railway companies, in consequence of Government action, to give at all times pre-war accommodation. Mr. Justice Lush agreed, and added, if this case had been tried before the war Mr. Jones would have been entitled to recover damages. This legal decision disposes of your query.

[Reply to A. NEWTON.]

Some Locomotive Queries.

The firebox heating surface of the "George the Fifth" class 4-4-0 engines on the L. and N.W.R. is 165.75 sq. ft. Nominal tractive effort of the 4-6-0 4-cylinder "Claughton" class engines of the same Company, at 80 per cent. working pressure, is 22,300 lb., and of the G.C.R. 4-cylinder 4-6-0 "Lord Faringdon," which has cylinders of ½ in. greater diameter, and a working pressure higher by 5 lb., 23,670 lb. But why not calculate these efforts for yourself from the formula T (tractive effort) $= \frac{d^2sp}{D}$, where d=diameter of cylinders, s=stroke, D=diameter of driving wheels (all taken in inches), and p=80 per cent. (the customary proportion) of the working pressure of the engine in lb. per sq. in.? This formula applies to a 2-cylinder simple engine; add 50 per cent. to the result in the case of a 3-cylinder simple, and doubts if for a 4-cylinder simple. Leading dimensions of all new locomotive types are published in the RAILWAY MAGAZINE from time to time.

[Reply to A. L. ROTHERHAM.]

Locomotive Maintenance.

It is somewhat difficult to determine what is the "recognised percentage of locomotives which should be on the road, and the number out of service," including those in the shops undergoing general repairs. The number depends on the facilities possessed by the company concerned for repairing, *i.e.*, the number of locomotives which can be dealt with at any one time, and also on the exigencies of the train service at any given time, summer train services in this country, for example, requiring considerably more engines on active service in normal times than winter services. In 1913, the last year for which official figures are available, out of 21,032 locomotives owned by the railway companies of the British Isles, 2,967, or 14.1 per cent., was the average number laid off for repairs at any given date, the figures varying from 6.3 per cent. in the case of the North British Railway to 22.5 per cent. in that of the South Eastern and Chatham Railway.

[Reply to J. H. CRAMP.]

Train on Wrong Line.

Your photograph has been submitted to Mr. F. E. Mackay, the railway photographic expert, whose article on railway photography appeared in the RAILWAY MAGAZINE, April, 1918, and he remarks: "I can only suggest that the film has been the reverse way in the camera, or else has been printed the reverse way in printing. If the train was, in fact, *actually* travelling on the up road it would be quite impossible to show it otherwise, and, therefore, my remarks above point to what may have happened. I do not know the station through which the train is passing, so am unable, from experience, to fathom the mystery beyond what I have said. There is an absence of advertisement boards on the station to enable me to prove my remarks that way, neither can the number on the engine be seen."

[Reply to W. JAMES.]

Distant Signals.

Most of the distant signals on the L. and S.W., L.B. and S.C., S.E. and C., and G.E. Railways are fitted with the Coligny-Welch patent lamp, with which, by a reflecting arrangement, an illuminated white fish-tail is shown at

Digitized by Google

night against the signal lamp proper. On certain of the Underground lines yellow instead of red has been adopted as the light for distant signals at danger. On all other lines drivers are dependent on their intimate knowledge of the road to distinguish at night between distant and home or starting signal lights, and this is admittedly a defect in the signalling arrangements of this country, as a red light which at one point enjoins a stoppage may at another be passed at speed. At the same time, the problem is not one easy of solution.

[Reply to P. A. W.]

South Eastern and Chatham Railway Running Sheds.

In fixing the importance of a running shed there are other things to consider besides the number of locomotives there stationed. Of London running sheds belonging to the South Eastern and Chatham Railway, it is generally understood that Battersea stands first and Bricklayer's Arms second, although at the former there is usually stationed about 110 locomotives, and at the latter, as a rule, no fewer than 120. However that may be, the official positions of the London running sheds of the South Eastern and Chatham Railway are: Battersea, 1; Bricklayer's Arms, 2; Slades Green, 3; Cannon Street, 4.

[Reply to "HIGHLAND CHIEF."]

The Fastest Train in Europe.

The train you mention—the Nord Company's 7.50 a.m. from Paris to Berlin—had probably the best claim of any to the above title before the war, but the journal in question was wrong in giving the time from Paris to Erquelinnes as 144 min. Actually it was 151 min. for the distance of 149¼ miles, but this figure included a stop of 3 min. at St. Quentin, the 95¾ miles from Paris to the latter town occupying 93 min. only, at an average speed of 61.8 m.p.h. Also the 8.10 a.m. and 12.35 p.m. ran to St. Quentin in 96 min., the 1.45 p.m. in 94 min., and the 7.10 p.m. to Busigny, 112½ miles, in 114 min., so that this was an exceptionally rapid service.

[Reply to G. PLENDERLEITH.]

Electric Fouling Bars.

You have evidently mistaken the use of electric fouling bars, which is by no means confined to electrically operated lines. They are provided on busy sections of line, and more particularly in stations or their immediate neighbourhood, in order that trains or vehicles standing on them may not be overlooked by the signalman controlling the section concerned. The flanges of the wheels depress the bar, thereby completing an electrical circuit, and either actuating locks on the signals giving admission to the section, or ringing a bell or making visible indications in the box that the section is not clear.

[Reply to "SOUTH COAST."]

Cleator and Workington Junction Railway.

This is an independent company, serving the iron ore and colliery districts of West Cumberland, and connecting the London and North Western lines at Rowrah and Cleator Moor with those of Workington and Siddick, while another branch runs from Workington to Linefoot, on the Cockermouth branch of the Maryport and Carlisle Railway. It has six locomotives, mostly six-coupled saddle-tanks, and 243 goods vehicles, but the passenger traffic is worked by the Furness Railway Company under arrangement. Total length is 30¾ miles. An article on the C. and W.J.R. appeared in the RAILWAY MAGAZINE for September, 1912. [Reply to J. P. BRIERLEY.]

Somerset and Dorset Joint Railway.

It was by the opening of the Corfe Mullen to Broadstone Junction line, 2¾ miles in length, that the Somerset and Dorset Joint Railway obtained a direct entrance to Bournemouth. This was on April 26th, 1886. By referring to page 238, "Railway Year Book," 1918, you will note among the running powers of the Somerset and Dorset Railway, the Poole and Bournemouth line of the London and South Western Railway is mentioned. An illustrated article on the Somerset and Dorset Joint Railway appeared in the RAILWAY MAGAZINE, May, 1917.

[Reply to EDWARD JAMES.]

Gradients.

Gradients of the Great Northern main line were given in detail in Mr. Cecil J. Allen's "British Locomotive Practice and Performance" in the June, 1916, RAILWAY MAGAZINE, which is still obtain-

Digitized by Google

able, and we cannot spare the space to recapitulate them in these columns. Gradients and locomotive work on the Great Central Railway between Woodford and Leicester were dealt with by the same writer last month. No details have yet been made public by the G.N. Company as to the gradients on the new loop line between Cuffley and Stevenage.

[Reply to P. A. W. and K. A. KINDON.]

The Canterbury and Whitstable Railway.

This line, the second public railway opened in England, was described by Mr. C. R. Heney (*South Eastern and Chatham Railway*), in the RAILWAY MAGAZINE, October and November, 1907 (Vol. XXI.). The articles were illustrated with map, gradient profiles, plans, and reproductions of train and locomotive pictures of the period of the opening and the early days of the line. The parts are out of print, but you might purchase them, or the volume in which they are included, from a second-hand bookseller.

[Reply to A. F. LEATHER.]

Deceleration of Express Trains.

At high speeds the various resistances to motion, both internal, and especially external, from the atmosphere, increase in so much greater ratio than the speed itself that the maintenance of high speeds over long distances by passenger trains is always costly, principally in fuel. The cost of upkeep of rolling stock and track is also enhanced. Considerable savings are thus effected by slowing down express passenger trains, or, alternatively, the locomotives are able to tackle heavier loads on the slower schedules.

[Reply to W. S. UPTON.]

The Dornoch Light Railway.

This line, the first "light" railway in the Highlands, was opened on June 2nd, 1902, and was illustrated and described in the RAILWAY MAGAZINE, July that year. The line is 7¾ miles in length, and connects the ancient burgh of Dornoch with the extensive system of the Highland Railway. The magazine part containing the article has long been out of print, but if you will call at the RAILWAY MAGAZINE offices when next you are in London, you can inspect the "file" volume containing it. [Reply to ALEC SCOTT.]

Water-Troughs on the East Coast Route.

In travelling from Edinburgh to London by East Coast route, trains pass over track water pick-up troughs between Belford and Lucker and between Danby Wiske and Northallerton, North Eastern Railway, and also between Bawtry and Scrooby, between Carlton and Newark, and between Tallington and Peterborough on the Great Northern Railway. You can obtain further information of this character from the "Railway Year Book."

[Reply to "ATLAS WORKS."]

London and South Western Railway Tank Locomotives.

No very recent new classes of tank locomotive have been turned out by this railway, as the institution of electric working has obviated the necessity for building further engines of this type for some time to come. The latest tank engine design on this railway is probably the small 0-4-0 tank type employed for auto-train working, and built in 1910. Of ordinary suburban tank engines the 125 series of 0-4-4 tanks, built in 1911, are the most recent.

[Reply to H. D. MARR.]

Restaurant Cars, London and South Western Railway.

Restaurant cars are only now run on the London and South Western Railway between London and Exeter, and London and Bournemouth, the services to and from the North of England having been withdrawn some time ago, and also those between Waterloo and Portsmouth. The latter ran by the "Direct" route, *i.e.*, viâ Guildford.

[Reply to J. H. SUTCLIFF.]

London and North Western Railway "Renown" Class Engine No. 1948.

This locomotive, named *Camperdown*, is stationed at Widnes, and carries the 35W plate, not 35N, as stated. There is no such shed as 35N on the London and North Western Railway. Widnes (35W) is the only sub-shed under Speke Junction (35).

[Reply to ALFRED E. MARSDEN.]

Digitized by Google

Speed Recorders.

Apparatus working off the left-hand rear coupled wheel of London and North Western Railway locomotive, No. 238, *F. W. Webb,* is in connection with a speed recorder. It is fitted to several London and North Western Railway engines of the "George the Fifth" type, of which, be it noted, No. 238 is now one.

[Reply to E. H. DOLBY.]

Underground Stops.

Fewer stops on the "Underground" means economy. The energy required to start and accelerate a train on an electric line such as the Great Northern Piccadilly and Brompton Railway is considerable, and involves much consumption of current.

[Reply to A. VICTOR SMITH.]

George Stephenson.

The great pioneer of our railway system lived at Tapton House, Chesterfield, during the latter part of his life. He died there on August 12th, 1848, so that the seventieth anniversary of his death takes place in August this year.

[Reply to ARTHUR FOX.]

Continuous Brakes.

Continuous brakes are invariably applied in a series of short applications, as long or violent applications generally result in locking the wheels and producing skidding. The difficulty to which you refer does not, therefore, arise.

[Reply to W. S. UPTON.]

Owners' Wagons.

A Board of Trade Order has now been in force upwards of twelve months empowering railway companies to use private owners' wagons on the homeward journey.

[Reply to A. D. C.]

Suburban Rolling Stock, Great Northern Railway.

Suburban coaches on the G.N.R. are fitted only with the vacuum automatic brake, and the cylinders to which you refer are presumably those containing gas for illuminating purposes.

[Reply to J. A. DICK.]

Picking-up Water.

Travelling at 60 miles an hour over a water trough ¼ mile long an engine tender will pick up about 1,000 gallons of water, the weight of which would be 10,000 lb.

[Reply to W. P.]

Signals at Addison Road Station.

Signals at Addison Road, Kensington, are maintained by the London and North Western Railway, and are of that Company's standard pattern.

[Reply to H. D. MARR.]

Great Central Locomotive Classes.

"Consolidation" 2-8-0 engines on the G.C.R. are classed as 8K. Class of the new 4-cylinder 4-6-0 No. 1169 has not been made public.

[Reply to J. P. BRIERLEY.]

4-6-0 Engines, Great Eastern Railway.

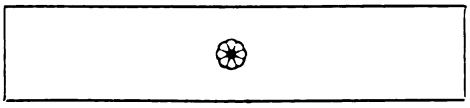
These locomotives have two inside cylinders, 20 in. diameter by 28 in. stroke, and their boilers are pressed at 180 lb. per sq. in.

[Reply to A. F. N. BRISCOE.]

Midland and Great Northern Joint Railway Locomotives.

During the continuance of the war the information you desire is not available to the public, and we are, therefore, unable to give it.

[Reply to G. CHRISTY.]



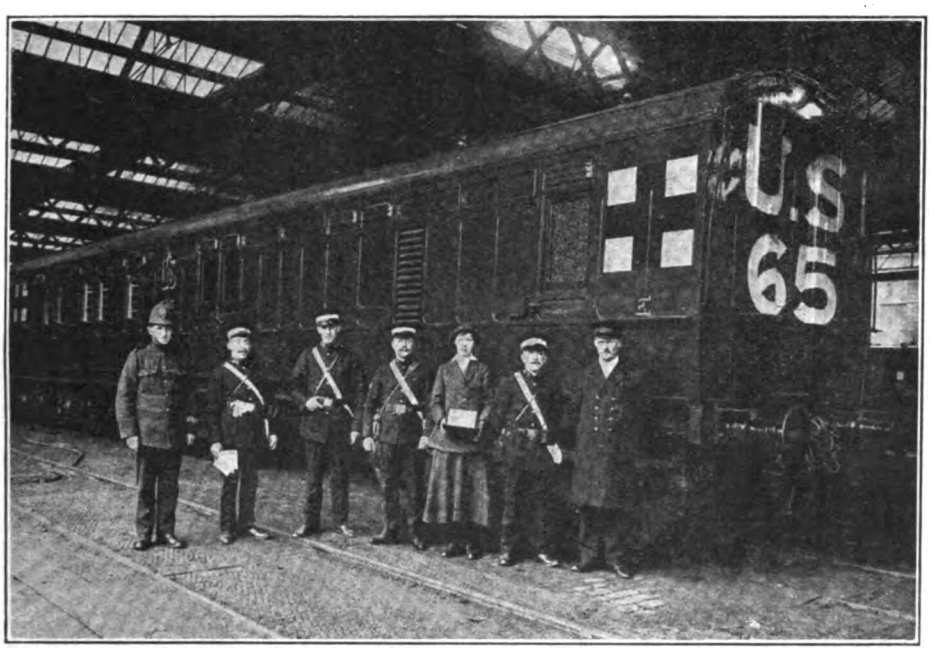
Digitized by Google

United States Ambulance Train, No. 65.

CONSTRUCTED AT WOLVERTON BY THE LONDON AND NORTH WESTERN RAILWAY.

AMBULANCE TRAINS for the use in France of the Army of the United States of America have been supplied by various British railways through the Railway Executive Committee, who have appointed what is known as "The Ambulance Trains for the Continent Sub-Committee." This body makes all arrangements regarding design, equipment, transportation, etc., in conjunction with military representatives from the British and the American Army. The coaches are transported to the Continent complete, so that a train is ready for service as soon as the vehicles arrive.

United States ambulance train illustrated above was, before its transfer to the war area, on view at Euston Station for two days. A large number of visitors were attracted, and the entire receipts were devoted to war charities.



THE COACHES AND EXHIBITION STAFF.

The train consists of sixteen vehicles, and the total length (exclusive of the locomotive) is 310 yards. Unloaded the train weighs about 440 tons. It is composed of long bogie, khaki-coloured vehicles, and is vestibuled throughout.

Digitized by Google

London and North Western Railway.

CHILDREN'S DAY AT WEMBLEY.

KIND and considerate was the clerk of the weather when the thirtieth annual summer meeting of the London and North Western Railway (London) Athletic Association was held on Saturday, June 8th, on the club grounds at Wembley.

Since the outbreak of hostilities the once noted sports have been discontinued, but the continuity of the series of summer meetings has been maintained by devoting the day to the entertainment of children. The races, the tea, the prizes, and later a conjuring performance, a marionette show, and some dances by the ladies of the operatic society, made a busy day for the youngsters, whose happiness amply repaid those who had worked so well on their behalf.

THE CHILDREN'S TEA HOUR.

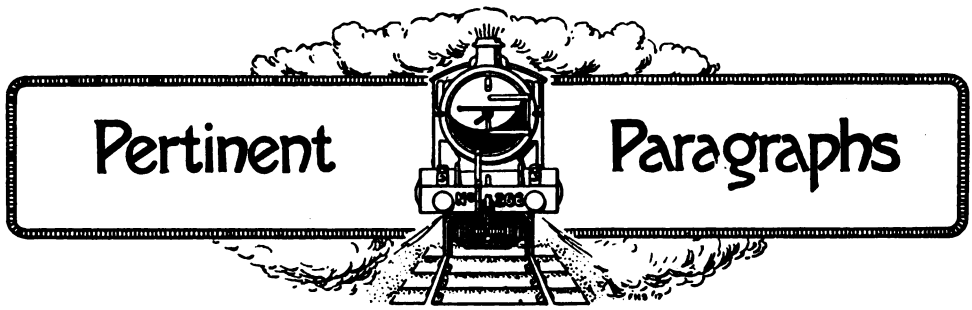
Among those present were Mr. I. T. Williams, the Acting General Manager, Mrs. Williams and Mr. C. F Graseman. Mrs. Williams, in distributing the prizes, had a kindly word for each little one. Mr. Williams expressed the pleasure that both Mrs. Williams and he felt at being present at so happy a gathering. He was convinced, he said, that the railwaymen with the Colours would wish nothing better than that their colleagues who had to remain behind should give the youngsters a good time, and judging by the happy faces around him this had been done. He thanked all who had worked so hard and so well together to make the meeting so successful, and he looked forward to future meetings at Wembley held under happier circumstances.

Photos] [*Topical.*

MR. C. F. GRASEMAN AND MR. AND MRS. I. T. WILLIAMS.

Mr. C. F. Graseman thanked Mr. and Mrs. Williams for their presence, and declared that the only complaint he had to make was that the handicapping was so good as to make his work as a judge very difficult.

Digitized by Google



Our Colour Plate.

THE popular type of locomotive which forms the subject of our frontispiece in this month's issue was first introduced by Mr. Churchward on the Great Western Railway in 1911, heralding an epidemic of 2-6-0 or "Mogul" building, which shortly afterwards spread to the Great Northern, London, Brighton and South Coast, Caledonian, and —more latterly—the South Eastern and Chatham Railways. At the time when No. 4301, the pioneer of this class, appeared, the G.W.R. had already 61 2-6-0 engines in existence, but these were inside-cylinder engines, built under the superintendence of Mr. W. Dean in the years 1901-3. So varied has been the work that has been undertaken with success by the later engines now under review, known officially as the 4301 class, that it is not surprising that their total now has reached 150. A number of these are engaged in performing useful war service "Somewhere in France." In addition to the haulage of fast goods trains, which constitutes their chief duty on the G.W.R., the outside-cylinder "Moguls" have shown their powers to advantage in passenger service, and have been timed to maintain speeds up to 65 m.p.h. on the level with heavy express trains, despite their comparatively small driving wheel diameter of 5 ft. 8 in. "Maids of all work" is perhaps the most apt appellation that one could apply to these engines.

Post-War Developments.

IN reply to the readers who have commented on the letter from "H. L. L." in the March RAILWAY MAGAZINE, advocating and foreshadowing the future use of high-capacity rolling stock, our correspondent writes:—

"I welcome the emphatic support from 'J. O. Killie' in the May issue, and I have also found endorsement for the views I have expressed in more than one expert and most influential quarter. Further study of the whole question has convinced me, as it has others, of the inevitable necessity of the reforms I have advocated among others, and a careful perusal of Sir Albert Stanley's recent speech in Parliament on the Board of Trade Vote should confirm any impartial observer in the same opinion. I have dealt at greater length than I can here with the whole subject in an article I have contributed to *The Organiser*, and which I expect will appear in the June number.

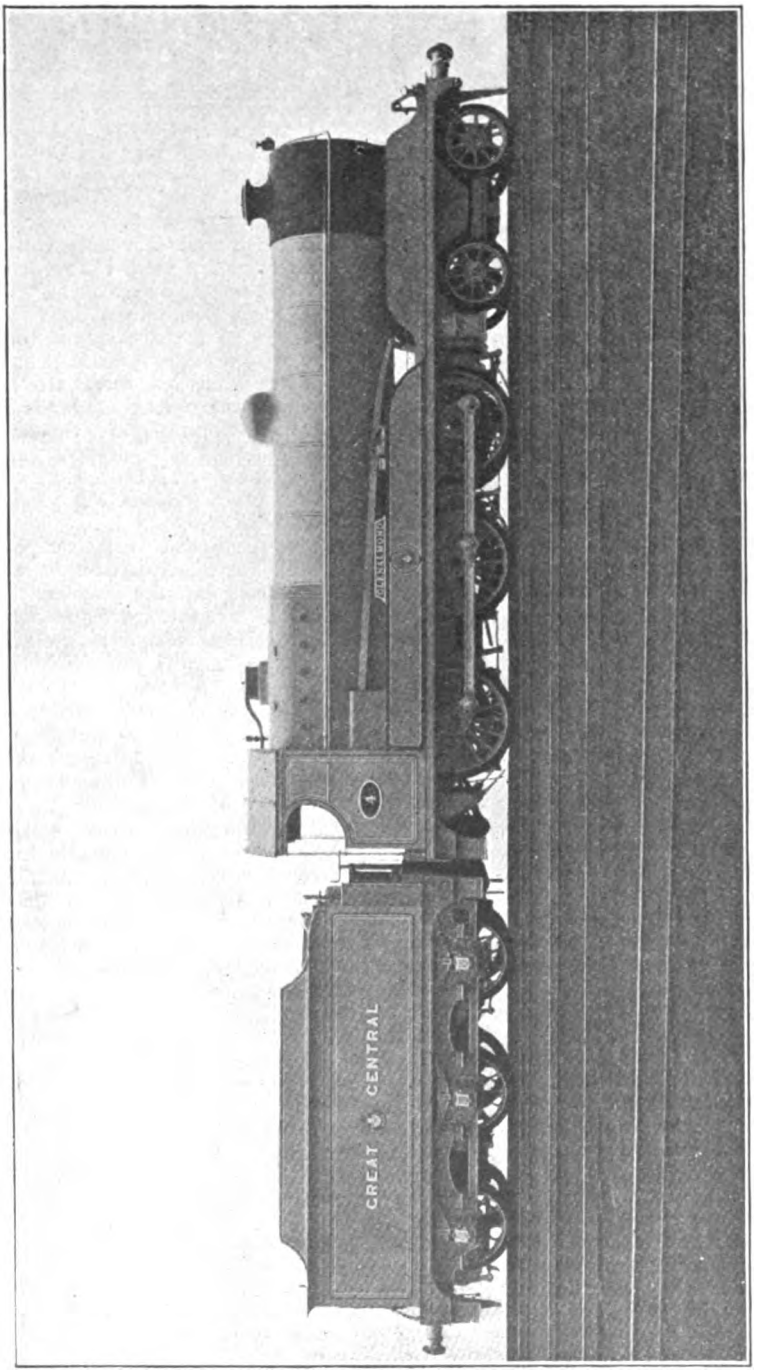
"Turning to your correspondents in America, it seems, according to Mr. Taylor, that some of the railways there are a bit 'overpowered' in the matter of goods locomotives. Over here things are very much to the contrary, and we have dropped further behind during the war. I do not believe anyone will defend 'double-heading' as an economical policy.

"In reply to 'C. S. S.,' who I expect is a Britisher, and not an American at all, I am willing to admit that the provision on a large scale of 30 or 40 ton freight cars—I prefer the American expression, as the article itself is entirely different from the ordinary British wagon—will entail a good deal of trouble and expense to begin with. All reforms which are worth anything do so. We shall want more men on trains; fewer, however, at stations. Continuous brakes and central couplings are, of course, necessarily involved in the change; they will cost money, but they will save lives and limbs, which no money will purchase. And they will save money, time and trouble in the end. We are not so much afraid of spending money in a desirable object as we were three years ago. No one proposes to scrap all the existing wagons and vans; I only suggest that we have quite enough of the old type, and that no more should be built after the war. The reform will be gradual, and take many years to accomplish.

"I read in a daily paper that the American soldiers in training over here find that nothing amuses them so much as the sight of an ordinary British engine hauling a goods train; it reminds them of a child's playthings. I can understand it is a joke to them, but it is humiliating to us that it should be so. Soon we shall have a full-sized American railway at work in France; let us hope our authorities will study its operation, and get useful lessons from it.

"I note that a writer who takes long views opposes standardisation of engines in a recent number of the *Railway Gazette*, on the ground of the variation in our loading

Digitized by Google



GREAT CENTRAL RAILWAY.

4-6-0 goods engine, No. 4, *Glenalmond*.

Wheelbase, 52 ft. 9½ in. Length over buffers, 63 ft. 0½ in.

	T.	C.	
Total weight of engine	74	9	in working order.
Total weight of tender	48	6	in working order.
Total weight of engine and tender	122	15	in working order.

Digitized by Google

gauges, and the probable necessity of our adopting a larger standard loading gauge in future, and I quite agree. It would cost a lot of money to enlarge the clearance to, say 16 ft. high by 10 ft. wide, but it would be worth while.

"In conclusion, I believe our British railways are, as regards the passenger service, as excellent and up to date in most respects as any in the world, and as regards the goods and mineral traffic, about half-a-century behind the times."

Railway Locomotive and Wagon Standardisation.

MR. H. N. GRESLEY, Locomotive Engineer, Great Northern Railway, in his inaugural address at the meeting of the Northern Centre of the Institution of Locomotive Engineers, touched upon the virility and enterprise of the Institution, as being an indication of the national spirit of the country, notwithstanding the war, and he went on to say the proceedings should afford an opportunity of exchanging experiences. There was much interesting work to be done in the Carriage and Wagon Department. The urgent need of the day was a standardised wagon, seeing that the wagons are now ubiquitous owing to the common-user arrangement, no time should be lost in producing a standard. The reduction of the ratio of tare to carrying capacity appeals very strongly to the locomotive engineer.

Mr. Gresley dealt with several points in locomotive history, such as Mr. Webb's "Greater Britain," which seemed when built to be the limit in size and power, and which is now too small for present needs. The present-day locomotive was, he said, the result of continuous evolution. This evolution was greatly accelerated by superheating. Much greater advantages are available from superheating. The power of an engine should not be judged by its tractive force, but by its capacity to provide steam demanded for its continuous work. He instanced the difference in Mr. Ivatt's "Atlantics," one with a small boiler, heating surface of 1,450 sq. ft. and a grate area of 24½ sq. ft., and the other with a large boiler, having a heating surface of 2,500 sq. ft. and a grate area of 31 sq. ft. The engines were in every respect identical, therefore the tractive power was equal in each, but the larger boilered "Atlantic" had proved to be much more powerful as an express engine than the small boilered one, and is able to haul much heavier trains and keep time. The remarkable result is that on the same work the large boilered engines use less coal, and favourable instances were given of the longer life of ample sized boilers. He spoke in favour of the direct stayed round-topped firebox as against the Belpaire in maintenance, etc. Continental and American engineers also preferred this system. The great desirability of accessibility which resulted from the use of outside cylinders, the better stayed frame, also inspection, oiling and maintenance of the motion being better secured, were dealt with. Mechanical lubricators led to economy and efficiency.

Standardisation has a strong advocate in Mr. Gresley. It is very desirable for locomotives to be standardised, but the present time was most inopportune. After 3½ years of such a war it would increase our difficulties by introducing new types of brake blocks, firebars, valves, piston rings, and would only be disastrous. It was not in the best interests of the country to adopt a standard engine. It must be done after the war, and the subject could be thoroughly dealt with during the coming session. He declared that engines were approaching their maximum weight and size, but were a long way from attaining their maximum power. We can and shall have to get more power per unit of weight. Pre-heat the feed water, utilise the heat going to waste in the exhaust steam and flue gases. The economy which can be obtained by the introduction of a really satisfactory feed water heater is second only to the economy which has resulted from superheaters. Grates have shown no marked improvement. Grates cannot be much larger, but they can be made more efficient. American engineers have devoted considerable attention to this. Another consideration was the burning of pulverised fuel, with which a far greater intensity of heat can be obtained than from coal burnt in the ordinary way.

There is much scope for development of the Carriage and Wagon Department. But for the war the introduction of steel carriages would have developed up to a surprising degree. Shortage of timber will effect this radical change. The use of multiple bogie coaches will extend, and this will mean a saving of 10 per cent. can be effected in the weight, and smoother running will be secured.

Anticipated Developments of Motor Transport.

RECENTLY speaking at the Royal Automobile Club, Colonel R. E. B. Crompton, C.B., first President of the Commercial Motor Users' Association, said the war had shown clearly how greatly everyone's comfort, convenience and health depend upon road transport. He referred to the great possibilities of a perfected system of collection and distribution of all products, raw and manufactured, and to the importance of cheap transport in all schemes of housing. After dealing with the fuel difficulties occasioned by the war, he called for cordial relations after the war between the railway companies and road vehicle owners. As a "prophet" he saw the old arrangements of shunting railway

Digitized by Google

wagons into roadside stations to unload from them small consignments of goods intended for the supply of the district as a thing of the past. The goods train will stop at a suitable platform, the side doors will be lowered, and in a few minutes containers assigned to the station will be wheeled off direct into the waiting motor wagons, which can deliver them to the points required up to a distance of from 30 to 40 miles from the roadside station.

In regard to Colonel Crompton's remarks, RAILWAY MAGAZINE readers are aware that in these columns we have more than once directed attention to the growing use of road motor traction by railway companies. There has been a notable tendency to develop it for the carriage of passengers, for heavy goods collection and delivery, and for light and express parcels traffic. When normal conditions once more prevail further developments in road motor traction by British railways may be confidently predicted.

Season Tickets.

QUESTIONS relating to railway season tickets have never been so prominent in Parliament or in the press as during the past few weeks. As recorded in the June RAILWAY MAGAZINE, Sir Albert Stanley, in the House of Commons, made a very strong case for the increase in prices which have been carried into effect. To-day the cost of operating a railway is totally different from what it was before the war, and we have Sir Albert Stanley's authority for stating that the increase in the railway wage bill due to war bonuses, granted to the railway staffs, amounts to 47 million pounds sterling per annum! It is patent that these increases in railway wages must in the long run be paid by the people who use the lines either as passengers or as the senders of goods and other traffic. As a war measure the State may have control of the railways, but as the State is the people, it follows that if any case, no matter how involved the arrangements may be, the public must of necessity foot the bill in one way or the other. Among the questions raised in Parliament recently, there was one by Sir Fortescue Flannery, who called the attention of the Assistant Postmaster-General to the hardship of numerous Post Office employés who, after retirement, have been recalled to assist the Post Office work, thus releasing younger men for active service, who are now compelled to pay higher rates for their season tickets on the railways to and from their work. Sir Fortescue asked for special allowances for such parties, but was told, on behalf of the Postmaster-General, that it would not be justifiable to relieve Post Office servants of the increased charges which fell on season ticket holders generally.

To questions raised by Mr. Bowerman, M.P., as to the feeling created by the action of the Railway Executive Committee in increasing the fares payable by season ticket holders, and the hardship thereby inflicted upon many thousands of business men, women and young persons who must of necessity continue to travel to and from their work by train, Sir Albert Stanley has replied expressing his regret concerning the hardships involved, but pointing out that for the reasons before stated the increase is necessary. Sir Albert declared his willingness to received deputations on the subject, but, at the same time, announced that the answer he had given must be final.

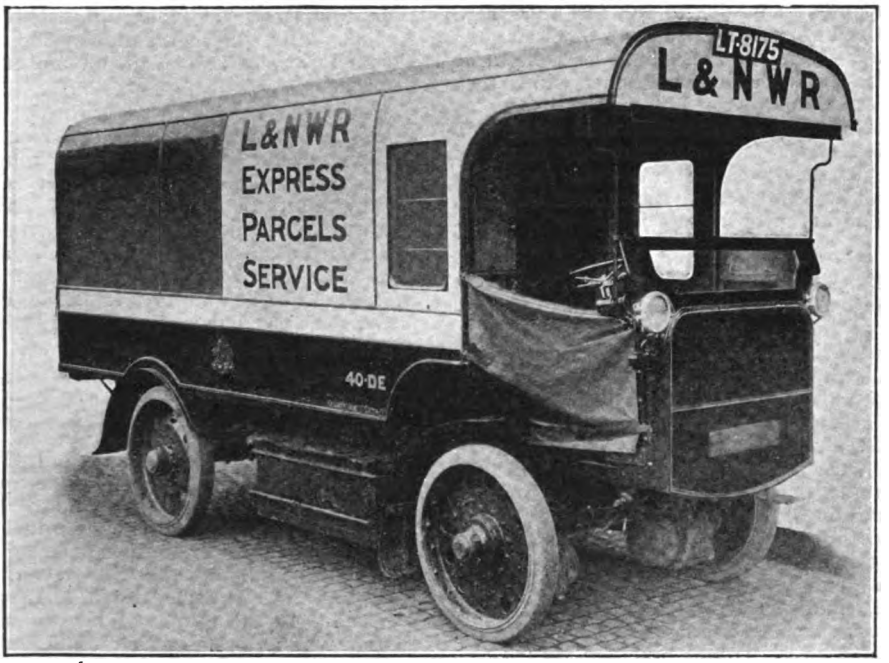
Correspondents at Brighton state that the effect of the "comb-out" of season tickets is really good, and invalids ordered by their medical men to this health resort are now able to find accommodation. The sifting of "seasons" was skilfully conducted under the supervision of Sir William Forbes, General Manager, London, Brighton and South Coast Railway, and hundreds of bomb-dodging aliens soon ceased applying for renewals of their tickets as a consequence of their certain refusal.

On June 5, Sir Albert Stanley, in the House of Commons, in reply to a question, announced that under the new regulations the issue and renewal of season tickets will remain with the railway companies as in the past, but Mr. E. Honoratus Lloyd, K.C., had been good enough to undertake the work of reviewing cases in which a railway company had, owing to the recent restrictions imposed in regard to season tickets, felt unable to issue or renew a ticket.

A Pioneer of Electric Traction.

MANY RAILWAY MAGAZINE readers will learn with regret of the death of Mr. R. W. Blackwell, one of the pioneers of electric traction. Mr. Blackwell was born in America, and was at Princetown University as a contemporary of President Wilson. He and two others installed and equipped electrically in 1884 the street car lines in Cleveland. About 1889-90 Mr. Blackwell visited England to give evidence for the promoters of the Central London Railway in their application for powers to build that line. The experience he gained during that visit led to his return to Great Britain to take up the question of electric traction. The first important work of this character was the conversion of the Bristol tramways to electric operation, followed by similar work in other cities and boroughs in the United Kingdom and abroad Mr. Blackwell's name will be remembered chiefly in connection with the electrification of the London, Brighton and South Coast Railway's lines. Lord Bessborough, the Chairman of the Company, expressed publicly, at the annual meeting in February, 1910, his

Digitized by Google



LONDON AND NORTH WESTERN RAILWAY.
New electrically-propelled parcels van.

satisfaction at the admirable manner in which the work had been performed, and illustrated descriptive articles on the enterprise appeared in the RAILWAY MAGAZINE, March, 1910, and June, 1911.

Steam and Electricity.

SOME valuable experiments have recently been made in Switzerland to test the commercial possibilities of generating steam with electricity derived from water power. A small boiler was used with 38 steel tubes, in 34 of which were placed heating coils. An evaporation of 2½ lb. of water per sq. ft. of heating surface was obtained, and the efficiency was 90 to 91 per cent. To compete with coal in Switzerland at 44s. per ton, the cost of energy would have to be not more than 0.08d. per unit. Owing to the scarcity of coal, which now costs over £3 a ton and is likely to reach £4, the working of the Swiss railways is costly and difficult, and the feasibility of using electrical heating on steam locomotives is being seriously considered. While the complete electrification of the railways cannot be accomplished at present, the supply of electricity to the locomotives would present less difficulty and the cost of energy from water power would be only 0.15d. per unit, which would be comparable with the cost of coal. In view of the possibility that the supply of coal from Germany may be completely stopped, the subject is of some importance to the railways, which would have no alternative in such an emergency.

Roaring Rails.

CONSIDERABLE interest appears to have been aroused by the answer recently given in our "Why and Wherefore" pages relative to "Roaring Rails." From Scotland "Glenar" sends details of certain particular places in which he has noticed this phenomenon. He has noted lengths of them particularly, when travelling by express trains, on either side of country stations, and very noticeably when the stations in question are situated on falling stretches of line, in which case the roaring is not so apparent on the uphill line of a double track. These facts confirm the opinion that the constant braking of trains over a certain stretch of line has something to do with the corrugation of the rails, owing to the abrasive action of the brake retardation on their top surfaces. He has also noted the phenomenon markedly in tunnels, which he considers due to the pitting of the rails with rust, owing to the damp condition in which tunnels are usually found. Mr. R. J. Deacock writes calling attention to a noticeable length of these rails between Faversham and Canterbury East, especially just east of Selling station, before entering the tunnel, going towards Canterbury. This

Digitized by Google

he supposes to be due to the fact that there was a bed of chalk immediately underlying the railway. Numerous such instances might be quoted, but the conditions under which they exist on almost every line are so diverse as to preclude any single explanation which will fit all cases. The only common factor in most instances is that the rails concerned are on the soft side in their chemical composition and properties.

Cecil Rhodes Dream.

THE great Empire builder, Cecil J. Rhodes, advocated a transcontinental railway, as far as possible through British-owned territory, to link together the various sections of British Africa. Slowly but surely the idea conceived by this foreseeing statesman is becoming materialised, and RAILWAY MAGAZINE readers doubtless noticed the recent announcements in the newspapers of the achievement, under Belgian control, of the last section of the Katanga Railway, which reached Bukama on the Congo River on May 22nd. This railway is the prolongation of the great line which, starting from Cape Town, and crossing Bechuanaland and Rhodesia, reached the frontier of the Belgian Congo in 1909. It was built for the "Compagnie du Chemin de fer du Bas Congo" by a British firm, Messrs. Pauling and Co. The first section (158 miles) reached the copper mines of the Star of the Congo in November, 1910, where Elisabethville, a populous town, inhabited by 1,400 white men, has since developed. The railway was pushed in 1913 as far as Kambové, another important mining district (99 miles). In spite of the difficulties caused by the war, a third section was open to the traffic north of Kambové, reaching Djilongo (68 miles) in July, 1915. It was through this road that the two English monitors, under the command of Commander G. B. Spicer Simson, reached the waters of Lake Tanganyika, which they cleared of enemy craft. Understanding the advantages which the line would afford, the Belgian Colonial Government opened new credits for the completion of the railway as far as Bukama (125 miles). The building started from Djilongo and Bukama at the same time, and, in spite of the difficulties of the ground and the scarcity of labour in the region traversed, has now been successfully completed.

Within eight years, 450 miles of railway have been thus constructed from the Rhodesian frontier to the navigable waterway of the Congo, and out of these nearly 200 have been laid during the war. It is now possible to go by rail and by boat from Cape Town either to Boma and the mouth of the Congo, or to Dar es Salam by using the Belgian railway to the Tanganyika, completed in 1915. The new railway may also be considered as a link in the great line from Cape to Cairo. It would suffice to connect Redjaf, on the Nile, with Stanleyville, on the Congo River, to realise the dream of Cecil Rhodes.

Meanwhile the Katanga Railway is rendering great service to the allied cause by bringing every year to Britain's munitions works 30,000 tons of copper. It is noteworthy that the first survey of the road followed by the new line was undertaken by Commandant, now Lieut.-General, Jacques, who commanded the Third Division during the successful counter-attack of the Belgian army, near Langemarck, on April 17th last.

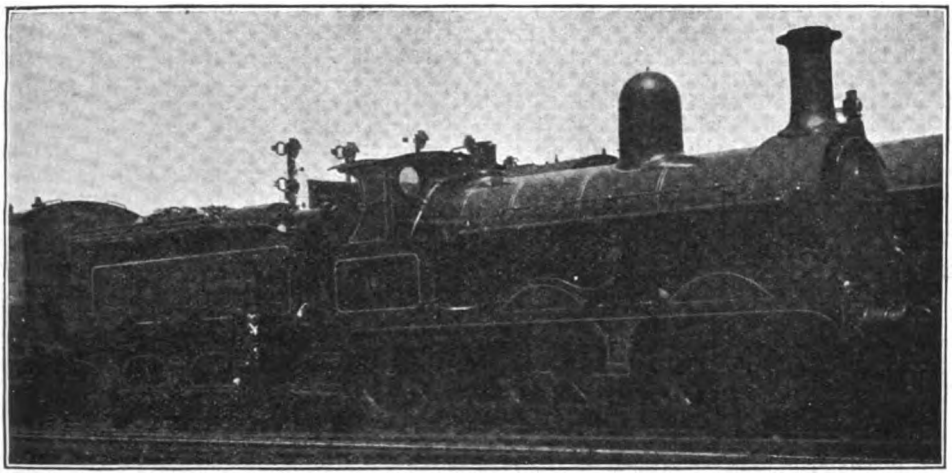
RAILWAY MAGAZINE readers will watch with interest the forthcoming developments of this epoch-making enterprise.

The Channel Tunnel.

A PAPER on "London and the Channel Tunnel" was read Thursday, June 13th, by Sir Arthur Fell, M.P., Chairman of the House of Commons Channel Tunnel Committee, at a meeting of the London Society, held in the hall of the Society of Arts, Adelphi. Sir Francis Fox, M.Inst.C.E., presided. In the course of his remarks Sir Arthur Fell said the tunnel would consist of two parallel tubes, as in the case of the great Simplon Tunnel (12½ miles in length) under the Alps. Reasons for adopting twin tunnels are numerous. They include better facilities for ventilation, drainage and repairs to the structure and permanent way when these are necessary during traffic, as well as greatly increased safety in case of derailment.

It is proposed that the work of excavation shall be performed by revolving cutters, fixed in Greathead shields, by which system a rapid rate of advance will be attained, the debris being removed from the "face" of the chalk by high speed endless belts, so arranged as to deliver their load direct into wagons, without the necessity of shovelling or of any other manual labour. All the work will be carried on by electrically-driven machinery, by which the volume of air required for ventilation will be greatly reduced, and arrangements will be made so that excavation and other operations may be carried on at many points simultaneously, thus shortening the period occupied in construction. The diameter of each tunnel will be 18 ft., so as to accommodate all the great European express trains. At intervals of 200 yards along the entire length, oblique cross-tunnels will be formed to enable empty wagons to be brought in by one line, while full wagons are being despatched on the other, and also to permit a perfect system of ventilation to be installed. It is intended that the tunnel shall be worked, ventilated and pumped by electricity supplied from a power station in Kent, possibly 10 miles or more inland. The problem of ventilation

Digitized by Google



Photo] [*W. H. Whitworth.*

NORTH STAFFORDSHIRE RAILWAY.

0-6-0 goods engine, No. 112, at Manchester.

during regular traffic will consequently be comparatively simple, no combustion of coal on the railway being necessary. It is suggested that the tunnel shall be maintained under the authority of the War Office, and a dip in the level of the rails forming a "water lock," by which the tunnel could, in case of emergency, be filled with water from floor to roof for a length of a mile, would similarly be under the control of the Military Commandants at Dover Castle and the neighbouring forts.

The gauges of the English and French main line railways are almost similar, as is proved by the fact that at the present time hundreds of the largest English locomotives with thousands of trucks are now in use on French railways. Trains would be run direct from London to Paris in less than six hours, and these could, if required, travel at intervals of not more than five to ten minutes. As soon as they can pass under the channel these trains will be able to traverse France, Belgium, Holland, Italy, Germany, Austria, and Turkey as far as Constantinople without any difficulty or change of gauge. Through sleeping and dining cars will run direct from London over the great European express routes, and the rolling stock required will be specially built by the railway companies engaged in the traffic. The tunnel would, without pressure, be able to transport in each direction 30,000 passengers as well as 30,000 tons of goods in twenty hours, leaving four hours each day for repairs and renewals. In the day trains an endeavour will be made to serve breakfast, lunch, tea or dinner in the restaurant saloons according to the hour at which they pass through the tunnel, and these cars will be brilliantly lighted and fitted with special means for deadening the sound. The journey through the tunnel will be scarcely noticed, and passengers will find themselves rolling along through the sand dunes of Etaples and in the Valley of the Somme without having realised that they have been carried in luxury and comfort under a rough, tide-swept and foggy sea, which is often almost impassable for ships. It is considered that the tunnel can be completed by improved methods of construction in about five years.

To meet the requirements of the traffic which will be created by the tunnel, Sir Arthur Fell recalled that a grandiose scheme is suggested, for the construction of a vast station between Waterloo Station and Blackfriars Bridge Road. For access to it there would be a bridge on the site of the present Charing Cross Railway Bridge and station, a high-level bridge level with the Strand like Waterloo Bridge, but double the width of Westminster Bridge, and joining the Waterloo Bridge Road somewhere near Stamford Street. Charing Cross railway bridge must, he added, be endured for the time, because during the war it is impossible to replace it.

Locomotive Lubrication.

SOME noteworthy points were brought out during the discussion on a paper entitled "Some Notes on the Working of Superheater Locomotives, with special reference to Lubrication," which was read before the Institution of Locomotive Engineers.

It was affirmed by one of the participants in the discussion that the experience on the London and North Western Railway in respect of carbonisation of oil is that the deposit is not formed to any extent while running under steam, but only when drifting, and it is interesting to note that an

Digitized by Google

analysis of the deposit showed it to consist of finely divided material which is drawn down the blast pipe into the valve chest when the engine is drifting. Experiments have proved that a vacuum of from 5 in. to 15 in. of water is obtained when running with the regulator closed and the reversing wheel in the running position, that is, three or four turns back, but when in full gear no vacuum is formed. The drivers have, therefore, been instructed to put their engines in full gear immediately the regulator is closed. The allowance of oil on the London and North Western Railway is one pint for every 40 miles, and is the same for either superheater or non-superheater engines of the same class.

It was further stated by the same speaker that certain engines of the eight-wheels coupled type have been fitted with the Wakefield mechanical lubricator for delivering oil to each of the eight axleboxes. It is found that these engines can run from London to Rugby and back, a distance of 160 miles, with one and a half pints of oil, and give no trouble whatever, whilst almost every other engine of the same class not so fitted continues to give trouble

Accidents in 1917.

By the report of the Board of Trade upon the accidents that have occurred on the railways of the United Kingdom in 1917, it is shown that the total number of persons killed by accidents in the working of railways was 899, as against 1,066 in 1916, and as against an average of 1,184 for 1906-15.

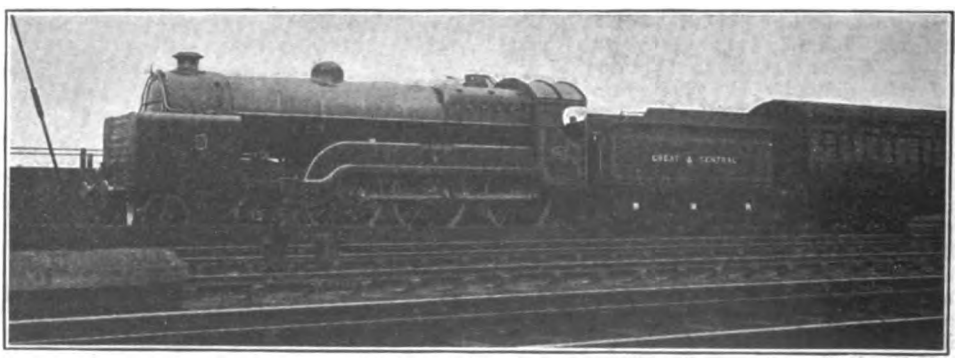
Cases of injury were 4,208 in 1917, as compared with 5,589 in 1916 and an average of 29,368 for 1906-15. Whilst accidents to trains proved more fatal to passengers in 1917 than in 1916, the number of deaths from this cause being 12 as against 3, there were fewer fatalities to passengers from other accidents, the number being 113 in 1917, as against 156 in 1916. The average for 1906-15 was 44 passengers killed in train accidents and 113 in other accidents. Amongst railway employees the fatalities were on the whole less in 1917 than in 1916, and less than the average for 1906-15. Thus accidents to trains killed 5 employees in 1917, as compared with 12 in 1916, the average for 1906-15 being 9.

Other accidents in which the movement of trains and vehicles was concerned also proved less fatal, the number of deaths of employees from this cause being 331 in 1917, as compared with 402 in 1916, and with 389, the average for 1906-15. On the other hand, accidents in which the movement of trains and vehicles was not concerned caused 46 deaths of employees in 1917, compared with 39 in 1916, and an average of 45 for 1906-15.

Lord Shaughnessy and the Canadian Pacific Railway.

Whether he happens to be dealing with unprecedented movements of freight, with governmental agencies bent on raising revenue in the easiest and quickest way, or with investors whose confidence in the security of their savings has been subject to great and prolonged strain, Lord Shaughnessy is no mean strategist. Like General Foch, he believes in allowing his opponents to come as hard and as far as they will against a position which he knows he can maintain.

So far as the Dominion Government is concerned, however, remarks the *Wall Street Journal*, it would be unfair and untrue to represent the Chairman of the Canadian Pacific as in any real sense an antagonist. At the moment when the Government has imposed special war taxes upon his road, which by methods of perhaps questionable constitutionality deprive it of any advantages from a general rate increase granted to all other Canadian railways and impose serious burdens besides, Lord



Photo] [*W. H. Whitworth.*

GREAT CENTRAL RAILWAY.

4-6-0 locomotive, No. 423, *Sir Sam Fay*, with speed indicating apparatus.

Digitized by Google

Shaughnessy discards the advice of well-meaning friends of the company on both sides the international line and replies: "We shall pay the tax without protest."

It was a surprising answer, and yet it might have been expected from the man who for more than three years has laboured with the vast means at his command for Canada, and for the Allies, and for all liberal thought, as has the dean of the transportation industry in the Dominion. Appreciating, as few men do, the importance of morale in war finance and war industry at home, Lord Shaughnessy takes the same occasion to show his shareholders a really amazing exhibit of financial strength in the Canadian Pacific. At another time and in other circumstances the Chairman's address to the shareholders at the recent meeting might have led to the suggestion in unfriendly quarters that he was "booming" his company's stock. But it was characteristic of Lord Shaughnessy that he did not make it when it might have served such purposes, but reserved his ammunition against a time of need. It may be surmised that he thought the shareholders entitled to all the protection from their own fears that he could legitimately give them.

The Canadian Pacific's record as its Chairman presented it might well become a text-book for railroad managers everywhere. There have doubtless been numerous cases in which the spirit of enterprise faced and conquered as great obstacles to the construction and development of a great transportation system. There have perhaps been some cases in which success brought with it as great temptations to extravagance in management or to hurried gathering of profits, but there have been few indeed in which such temptations have been as constantly resisted in favour of opportunities for more and better and cheaper public service.

In a word, Lord Shaughnessy told his shareholders that they and their property could stand the war and all its consequences, that the day would arrive when they would share individually in the huge success that has attended the Company's forty-year struggle to build up the wilderness, but that they must possess their souls in fortitude and await the longer future.

The Desert Railway.

THERE has recently been published by Constable and Co., Ltd., a very interesting book by W. T. Massey, official correspondent of London newspapers with the Egyptian Expeditionary Force. In it the author makes due acknowledgment of the fact that without the railway the desert operations on the scale planned for them would have been impossible, and there could have been no military advance into Palestine.

In competition with narrow-gauge railways in the somewhat hard western desert the motor car was unbeatable, says Mr. Massey, but the self-propelled vehicle was hopelessly out of it with the main line of railway in the Sinai Peninsula. Against the narrow-gauge lines in the central and southern sections, where roads had been made, the light car and motor lorry were easily first, but in the long journey to the frontier and into Palestine the railway was so supreme that no other means of land transport was dreamed of, except, of course, the supply trains of camels from railhead, wherever that might be for the moment. It is doubtful, however, whether the most sanguine engineer ever believed this single line could do the amount of work which was thrown upon it. The standard gauge railway running from Kantara to Palestine was the keystone of our strategic structure in Eastern Egypt. It was the backbone, the arteries, the very life blood of the Army. Running over it were London and South Western engines and trucks with loads infinitely heavier than they ever hauled between Southampton Docks and Nine Elms. Without cessation night and day, week in week out, they moved on a journey out and home of 300 miles to a time-table jealously guarded by R.T.O.'s and their staffs. To the conveyance of construction materials and supplies was added the constant movement of troops and equipment, yet the line which, by all the pre-war theories of railway management at home would be held to be grievously overworked, did its job with extraordinary smoothness and efficiency.

It was a triumph for the railway companies of the Royal Engineers, for the officials of the Egyptian State Railways who became part of the military staff, and for the construction gangs of Sikh Pioneers and Egyptian Labour Corps. These latter proved the finest navvies in the world. They had to build the line right under the enemy's nose. Protected by a thin line of outposts the Gyppy labourers worked under an hourly fear of aerial bombs. They got them often, and at El Arish one bomb killed and wounded thirty-nine of them. But under British and some Syrian officers, and with the splendid example of the Sikhs, they did marvellously well, and it is merely stating the obvious to say that if battalions of troops had taken their place, the line's rate of progress would not have been maintained. Heat affected the labourers but little. They received much more than the market rate of pay in the Delta, their food was good and plentiful, they had uniforms and blankets provided for them and tents to sleep in. At the end of every three months ten days' leave on free passes was given, and the gangs going to their "Blighty" made one of the cheering sights of the line—trainloads of happy labourers, with pocketsful of money, singing and clapping hands and waving anything they could make in the shape of a flag. The officers, by tactful control—there was

Digitized by Google

not the slightest semblance of oppression—had got the most out of them, and the Gyppy had well earned his holiday.

In the early days of August, when a Turkish division ran into a hornet's nest at Romani, that place was railhead. During the battle construction was stopped, but immediately the Turks retraced their steps from Bir el Abd the work of track laying was resumed. Construction became slower near El Arish because the ground was softer and less suitable for a rail bed. There may not have been many engineering obstacles on the route, but sand dunes had to be avoided or cut, and embankments built up of sand required careful watching, whilst the line had to carry heavy traffic immediately rails were laid. At El Arish a viaduct had to be made over the Wadi Arish, the old river of Egypt, down which on some days in winter a spate half a mile wide rushes to the sea. The first line was carried over on sandbag foundations, because the military situation would brook no delay, but the permanent viaduct is now in use. After the second battle for Gaza our wide front necessitated further developments, and the line is much bigger than originally planned.

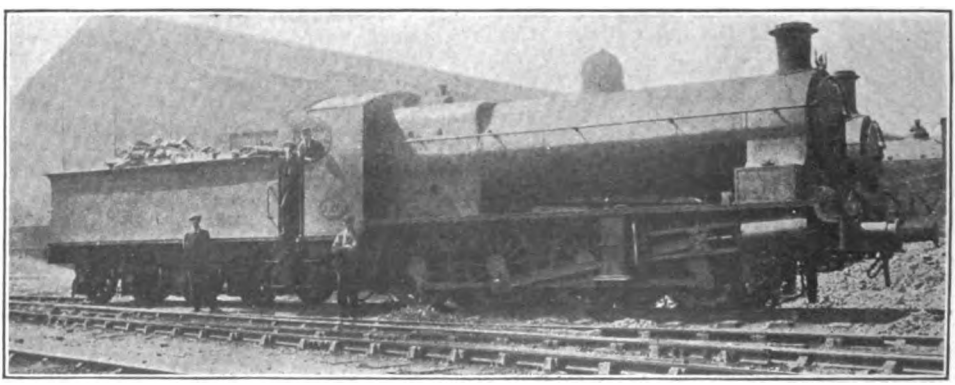
Russia and Her Railways.

AN earnest and impartial examination, based on expert information, of the manifold causes of Russia's military collapse, and of the world situation created by it as it affects the Allies, is given in a sixpenny pamphlet, entitled "The Russian Riddle," by M. Zinovy N. Preev, published by John Bale, Sons, and Danielsson, Ltd., Oxford House, Great Titchfield-street, London, W.1.

In his examination of the causes of the military collapse the author lays great stress upon the inadequacy of the railways. He remarks :—

"What British shipping is to this country railways are to Russia. The outlying provinces of Russia are, economically speaking, her colonies. She depends on them in exactly the same way as the United Kingdom depends on her colonies for her food and raw materials. Russia is fed and supplied with raw materials mainly by railways. The wheat fields of the Ukraine, the coal and iron mines of the Donetsk Basin, the oil wells of the Caucasus send their products to the industrial centres of Northern and Central Russia mainly by rail. The great cities, such as Petrograd, Moscow, Kieff, especially those removed from the agricultural districts, depend even in normal times for their daily bread on the smooth working of the railways, the cold storage and the machinery of distribution being hardly adequate for their daily requirements. The war, with its sudden migration of great masses of the population from occupied districts to other parts of Russia, especially to the great cities, threw the food distribution machinery completely out of gear. The population of Petrograd nearly doubled, that of Moscow increased by about a million. It was then that the need of improved railway facilities became more urgent than ever, but, instead of improving, they degenerated, under the stress of war work, and because of the lack of the most necessary repairing machinery and tools, endangering the very existence of great urban communities.

Even under normal conditions Russia's railway facilities are far from adequate. Russia possesses only one mile of railway to 3,815 of the population; while the United Kingdom, in addition to its unrivalled shipping facilities, possesses a mile per 1,915 of the population. Compared with the area of the country, the difference is still more glaring. In Russia there is only about half a mile of railway to each hundred square miles, as compared with nearly twenty miles in this country. The war interrupted an ambitious

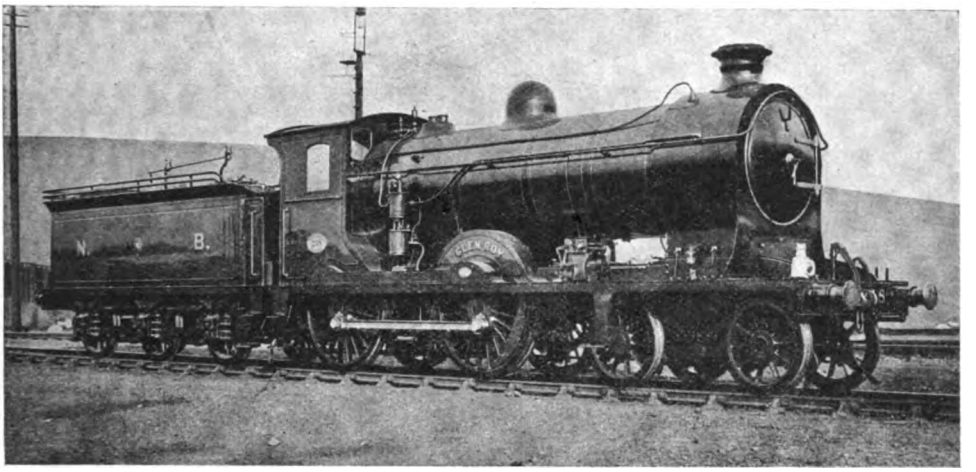


Photo] [*W. H. Whitworth.*

LANCASHIRE AND YORKSHIRE RAILWAY.

4-cylinder 0-8-0 locomotive with large chimney, No. 1471.

Digitized by Google

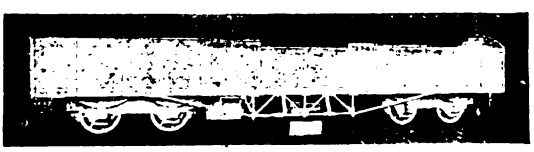


NORTH BRITISH RAILWAY.
4-4-0 superheater engine, *Glen Roy*.

Russian plan of railway development which was absolutely dictated by the normal requirements of the country, let alone the abnormal requirements of the war on extensive fronts. To this great handicap can be traced the disorganisation of railway traffic, the root cause of Russia's economic crisis, and the resultant inability of the Russian people to continue the war to a successful conclusion. Russian war weariness, it must be clearly understood, is based not on callousness, as superficial observers might imagine, but on terrible economic and social conditions under which no people could carry on the war."

After dealing with food shortage in some parts of Russia while there was abundance in Siberia, Mr. Preev sums up the situation thus :—

"The disorganisation of Russian transport has been occasioned not merely by the mechanical breakdown of its machinery, but by the very system of management—or mismanagement—adopted by the then Government from the very commencement of the war. Instead of co-ordinating the purely military traffic with the normal functions of the railways, giving, of course, due precedence to the more urgent requirements of the army and navy, but at the same time assuring the minimum needs of the civilian population, the two functions of the machinery of transportation were allowed to operate on totally independent lines, so that even when the needs of the civilian population were not sacrificed to the military requirements the two independent and insufficient systems clashed with one another, creating congestion on the railways, food shortage in this or that district, leaving whole industries without fuel and materials."



Digitized by Google

WHAT THE RAILWAYS ARE DOING

Of the numerous recipients of the Most Excellent Order of the British Empire, it is questionable whether there is a more genial and more deserving personage than Mr. H. J. Prytherch, who is in charge of the military section of the Chief Traffic Manager's Department, Great Eastern Railway. Mr. Prytherch has had a long and honourable career in the railway service, but since the outbreak of war his responsibilities have been greatly increased. With the insignia of the Order Mr. Prytherch was recently personally invested by His Majesty the King at Buckingham Palace. By the courtesy of the *Great Eastern Railway Magazine*, we are able to reproduce his portrait on this page from a photograph taken by Mr. Albert Hester, Clapton.

* * *

MR. H. J. PRYTHERCH,
Great Eastern Railway.

Lieut. N. Hope, who in railway life was an inspector attached to the North Eastern Railway Divisional Superintendent's office, Newcastle-on-Tyne, has been awarded the Military Cross for conduct officially described as follows: "For conspicuous gallantry and devotion to duty when a railway siding was bombed by enemy aircraft. Though wounded himself he carried a wounded officer to safety while the raid was still in progress and organised the work of putting out a burning ammunition dump. His prompt action prevented what might have proved a serious loss of life and ammunition."

* * *

We deeply regret the recent death, after a short illness, of one of the best known of Irish railway officials, Mr. Joseph Shanks, Chief Accountant of the Great Northern Railway (Ireland). Commencing with the Ulster Railway some fifty years ago, during the course of his railway career Mr. Shanks was intimately associated with the amalgamations which in 1876 culminated in the present Great Northern Railway (Ireland). He remained attached to the Secretary's office in Belfast till 1890. In the latter year he was appointed Chief Clerk to the late Mr. Henry Plews, then Secretary of the Company in Dublin, and eight years later Mr. Shanks became Accountant. At the various Conferences of Railway Officers his opinions on accounts and finance were a valuable asset, and for many years Mr. Shanks acted as Irish representative on the Committee of Accountants nominated by the Railway Companies' Association. He was also on the Accountants' Committee of the Irish Railways' Executive. Mr. Shanks' loss is mourned, not only by those with whom he was professionally connected, but also by his host of friends outside railway circles, he having enjoyed the respect and affection of all with whom he came in contact.

* * *

Mr. John G. Shanahan has succeeded Mr. Shanks as Chief Accountant, Great Northern Railway (Ireland). Mr. Shanahan entered the service from school in the year 1895. After some short time in the Traffic Department, he transferred to the Audit Office, and subsequently passed from it to the Accountant's Office, where, for the last seven years, he has acted as Chief Assistant to the late Accountant.

* * *

The Hon. H. Burton, Minister of Railways for the Union of South Africa, has arrived in England to represent the Union, with General Smuts, at the forthcoming

Digitized by Google

sessions of the Imperial War Cabinet and of the Imperial Conference. Mr. Burton travelled in the mail steamer *Kenilworth Castle,* which sustained considerable damage en route through a collision with another vessel.

* * *

AMONG the records of men who have "risen from the ranks," it would (says a contemporary) be difficult to beat that of Mr. C. J. Cowley, of Dunvanter, who, sixteen years ago, was a railway carriage cleaner. At the outbreak of war he was a signalman in the service of the London and North Western Railway. He was called up with the Territorials, became sergeant in a Welsh regiment, and afterwards second-lieutenant, captain, and major, and is now temporarily acting as colonel in charge of a battalion. He won the D.C.M., was mentioned in despatches, and has now been awarded the Military Cross. He was wounded in France. He is thirty-eight years of age.

* * *

As announced in the RAILWAY MAGAZINE issue of September last, Lieut. J. W. Charlton, Inniskilling Fusiliers, was awarded the Military Cross for gallantry in the action at Messines on June 7th, 1917. Lieut. (Acting Captain) Charlton, who has had almost three years' service at the front, has now been awarded a bar to the Military Cross for military ability and gallant conduct in planning and leading an attack on an enemy outpost and destroying the works, killing and capturing all the occupants and the machine guns with which it was fortified. Four of the prisoners taken were Iron Cross men, and a machine gun, which was brought back complete, is being sent to Omagh as a war trophy from the Battalion. Before joining the Army Lieut. Charlton was in the District Office at Enniskillen of the Chief Engineer's Department of the Great Northern Railway (Ireland).

* * *

IT has been announced in the Supplement to the *London Gazette* that Mr. James Calder, General Manager of the North British Railway, has been appointed Lieut.-Colonel, Engineer and Railway Staff Corps, Royal Engineers (Territorial Force), from May 7th, 1918.

* * *

WE record with regret the death early in June of Mr. W. M. Turnbull, Assistant Superintendent of the Line, London and North Western Railway. Mr. Turnbull commenced his career on that railway in 1876 by going through all the departments of a country station and of a district office. Eventually he went to the Northern Division offices in Liverpool, under the late Mr. James Shaw, and soon afterwards became an assistant to that well-known capable officer. After two years in that position Mr. Turnbull went to Birmingham as Assistant District Superintendent, and in 1901 became the Birmingham District Superintendent. In 1903 Mr. Turnbull returned to Liverpool

THE LATE MR. W. M. TURNBULL,
Assistant Superintendent of the Line,
London and North Western Railway.

as District Superintendent, Northern Division, which position he retained until the autumn of 1914, when he was appointed Assistant Superintendent of the Line.

* * *

MR. FRANCIS EDWARD GOBEY, who has been appointed an Officer of the British Empire on account of the service he has rendered on work connected with the war, is the Superintendent of the Carriage and Wagon Department of the Lancashire and Yorkshire Railway at Newton Heath, Manchester. Since the beginning of the war continuous assistance has been given by his department to the Government in a great variety of manufactures for transport purposes, the most notable being the construction of eight ambulance trains for the British and United States armies. Mr. Gobey is a Lecturer in Railway Economics at the University of Manchester, a Member of the Manchester Court of Referees for the National Insurance Act, a member of the Manchester Munitions Tribunal, and a member of the Manchester Belgian Committee. He is also a Member of the Institution of Mechanical Engineers.

* * *

A DEPUTATION, representing the Govan traders, the station staff, and the head office, recently waited on Mr. Wm. Sibbald, late

Digitized by Google

Goods Superintendent, Glasgow and Paisley Joint Railway, at his residence in Ibrox, and presented him with a wallet of Treasury notes on his retiring from the railway service after 50 years' service. Mr. M'Lachlan, Superintendent, Govan Station, and Mr. John Fulton, Chief Accountant at the head office, having testified to the esteem in which Mr. Sibbald was held by the management and staff, Sir John Anthony, on behalf of the Govan traders, made the presentation. To deal successfully with traders, he said, required great tact, and Mr. Sibbald was specially endowed in that respect. In acknowledging the compliment paid him, Mr. Sibbald said he very specially appreciated the choice of the committee in selecting Sir John Anthony to make the presentation. They had both been for many years in the same railway service and knew each other so well.

* * *

MR. J. T. EDWARDS, Chief Clerk to the General Manager of the Taff Vale Railway, has retired after 63 years' continuous service. He is 76 years of age, and upon signifying his desire to retire the Directors suitably recognised his unique period of service. At a meeting of the official staff at Cardiff, Mr. T. A. Walker, Secretary, presiding, a reading chair and a smoker's cabinet, fully equipped, were presented to Mr. Edwards by the officers and staff. Mr. Beasley, Deputy-Chairman of the railway, who made the presentation by general request, said that his qualification to do so was that he had nearly reached a similar period of lengthy service, although his was under two companies, and so far as he knew Mr. Edwards' record under one railway had not been surpassed. Mr. Edwards expressed deep appreciation of the consideration for his comfort that had dictated the gift.

* * *

WE understand that Mr. David Williams succeeds Mr. Edwards, having been promoted as Mr. E. A. Prosser's Chief Clerk. Entering the service about 30 years ago as a boy, Mr. Williams has earned steady promotion by assiduous attention to duty and his wide knowledge of the railway system. He has rendered good service in connection with Parliamentary work. His promotion to the position vacated by Mr. Edwards is in keeping with the policy of the Company to encourage younger men whose ability and energy render them capable of discharging more onerous work. Mr. Williams will carry with him in his new work the good wishes of many friends in local railway and dock circles.

* * *

WAR work by railway officers does not lack the appreciation either of the ruling powers or the general public, and much satisfaction has been expressed at the honour of knighthood conferred on Mr. James Benjamin Ball for eminent services as Controller of Timber Supplies since 1917. Sir James Ball joined the staff of the Great Northern Railway in 1890, and in 1899 was appointed Engineer of the Lancashire, Derbyshire and East Coast Railway. When in 1907 this line was absorbed into the Great Central Railway he became New Works Engineer of the Great Central, and four years afterwards rose to be Engineer-in-Chief. He was responsible for the construction of the combined railway and road bridge over the Trent at Keadby, of which the lifting span weighs no less than 3,000 tons—the heaviest of its type in this country. In February, 1917, Sir James Ball was appointed Engineer-in-Chief of the London, Brighton and South Coast Railway.

Photo] [*Elliott & Fry.*

SIR JAMES BENJAMIN BALL.

Rather more than 12 months ago it was officially notified that as the problems connected with the supply of timber had only an indirect connection with the War Office, the War Cabinet had decided that it was advisable to transfer the Timber Supply Department from the War Office to the Board of Trade. A separate Department of the Board was, therefore, "established for the control of all timber, and Mr. James B. Ball, M.Inst.C.E., Engineer-in-Chief of the London, Brighton and South Coast Railway, whose services have been placed at the disposal of the Government by the Company, has been appointed by the Board to take charge of the Department with the title of Controller of Timber Supplies."

Digitized by Google

In the King's Birthday List of Awards of the Military Cross for "distinguished service in connection with military operations in France and Flanders," appears the name of Capt. Gerald McDermott, A.S.C., who prior

CAPT. G. MCDERMOTT, A.S.C., M.C.

to joining the Army in the first year of the war was manager of our weekly contemporary, *The Railway News*.

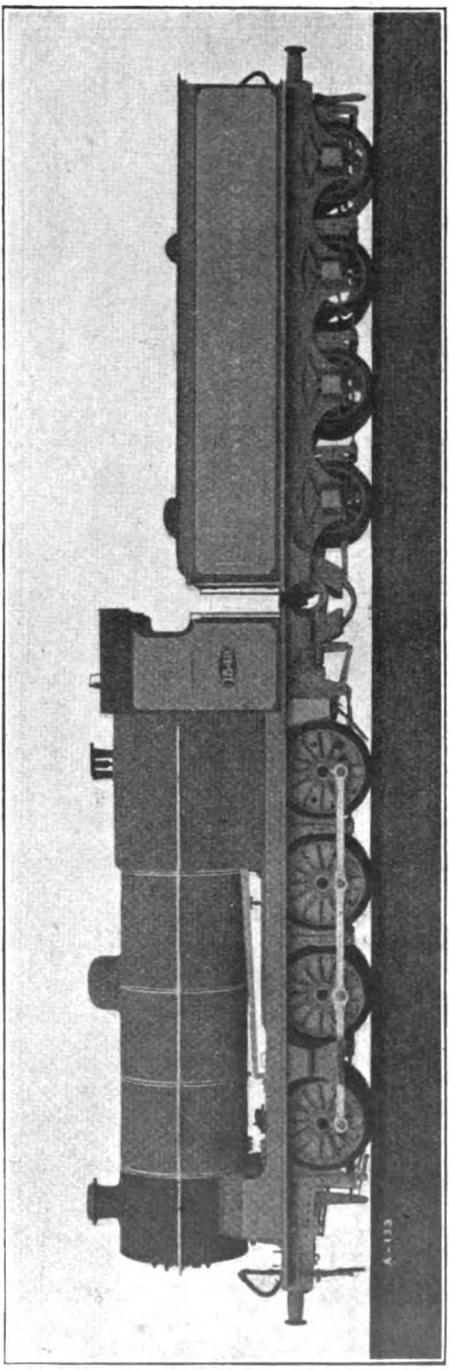
* * *

We regret to record the recent death of Mr. R. P. Ellis, M.V.O., who retired from the position of Superintendent of the Line, Great Eastern Railway, on December 31st, 1910. Mr. Ellis spent the whole of his railway life in the Eastern Counties. When quite a young man he was goods agent at Ipswich and afterwards he became in 1880 a District Goods Manager with headquarters at Norwich. Later in life he was London District Goods Manager, then Assistant Superintendent of the Line, and finally took over the position of Superintendent of the Line on January 1st, 1905, and held it for six years.

* * *

At the funeral of Mr. Henry Tylston Hodgson, Deputy-Chairman, Midland Railway, in addition to a large number of the leading offiers, there were present Mr. G. Murray Smith, Chairman of the Board of Directors; Sir Ernest Paget, Bart., and Mr. Gustav Behrens. The directors and officers of the Glasgow and South Western Railway were represented by Mr. David Cooper, the General Manager of the Scottish company.

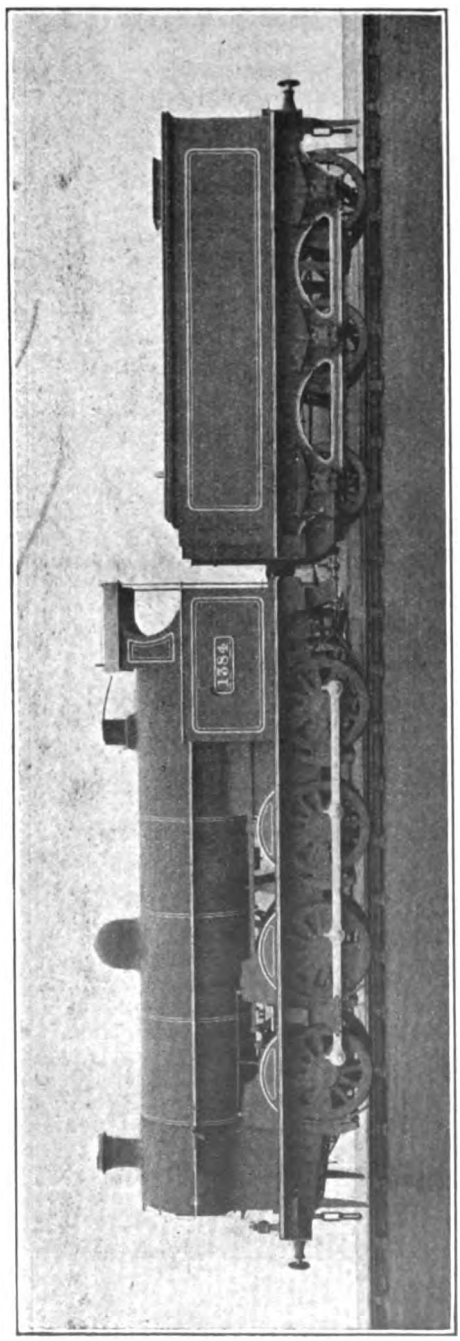
On the occasion of a recent visit to Sheerness and Chatham, H.M. the King sent for William Waters, of Battersea, who was driver of the Royal train, and thanked him for his care on similar journeys through a



LANCASHIRE AND YORKSHIRE RAILWAY 0-8-0 GOODS AND MINERAL LOCOMOTIVE.

Digitized by Google

long period of years. Waters entered the railway service 44 years ago, and has been an engine-driver for the last 37 years, during which period he has driven many Royal trains.



LONDON AND NORTH WESTERN RAILWAY 0-8-0 SUPERHEATED GOODS AND MINERAL ENGINE, NO. 1384.

COLONEL LAWSON B. BILLINTON, Locomotive Engineer to the London, Brighton and South Coast Railway, who was a member of a mission to Rumania, has returned to England after over 12 months in Russia and the East. "It was the Russian collapse that finished Rumania," he said to a newspaper representative. "I was in Rostoff-on-the-Don when Bolshevik troops captured the town. Though we were arrested, we were unharmed, and when I left for Moscow, I left in the private railroad car of the Secretary to a Bolshevik Minister of State. When the soldiers are travelling they collar any engine they see, and thrash any station-master who gives a civilian train preference. Engines are terribly scarce in Russia, and it is common to wait eight hours while one is being repaired."

* * *

SIGNALMAN TOWES and Guard Austin are held to be blameworthy for the two collisions in a tunnel on the London, Brighton and South Coast Railway near Earlswood on April 18th, when a goods train broke away and two others in succession ran into it. The Board of Trade Inspector says that Towes was not carrying out observation duty properly, whilst Austin took no action for ten minutes. If he had been alert the first collision could have been avoided.

* * *

REPORTING to the Board of Trade on the derailment of a train between Newby Wiske and Sinderby stations, on the North Eastern Railway, on April 15th, Colonel Pringle says that the accident was caused by a drop of a quarter of an inch in three rails at the point. The train was probably travelling at over 60 miles an hour. The drop in the rail would be sufficient to cause the engine tender and the coaches to leave the line.

* * *

WHAT constitutes a reasonable excuse for a railway journey in these days of restricted travel? This question is raised by "Q," of the *Evening News*, who tells the story of an old lady who got into a wrong train at Hadley Wood station, Great Northern Railway. As the train sped through New Barnet she turned to a fellow traveller and in consternation said: "Doesn't this train stop at New Barnet?" "No, madam; first stop Finsbury Park." "Good gracious me! Why, I've only come out to get my poor poll parrot some breakfast!"

* * *

WRITING from Knutsford, Mr. C. Kingsley, jun., suggests that the following note may interest many RAILWAY MAGAZINE readers.

Digitized by Google

He states: The Cheshire Lines Committee's train 6.30 p.m. from Chester Northgate to Manchester Central on June 10th, 1918, was worked by an 0-6-0 Great Central goods engine instead of the usual 4-4-0 Great Central passenger engine. When the train had completed 26½ miles out of the 38¾ it was quite punctual.

* * *

It appears that we were slightly in error in a recent answer to a correspondent concerning the use of the Pollitt 4-2-2 engines on the Great Central Railway over the Cheshire Lines Committee's system. Mr. A. L. Rotherham writes from Otterspool to the effect that Nos. 967, 969 (now superheated), 970, 971, and 972 take their regular turns on the "Punctual" express working between Liverpool and Manchester, the trains concerned being the 8.5 a.m., 10.20 a.m., 12.30 p.m., 4.20 p.m., and 8.30 p.m. *ex*-Liverpool, and the 8.30 a.m., 10.30 a.m., 1.30 p.m., 2.30 p.m., and 6.30 p.m. *ex*-Manchester. Our answer dealt with conditions as they existed until comparatively recently.

* * *

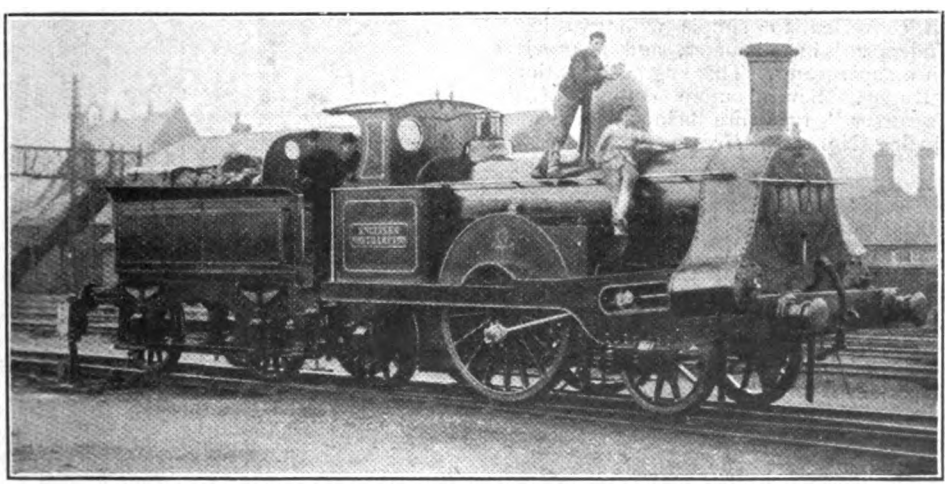
For the illustration on this page of London and North-Western Railway engineering department locomotive, *Northampton*, 1891-1902, the Railway Magazine is indebted to Mr. C. J. Alcock, Grays, Essex. This Trevithick 6 ft. single engine was originally No. 366, *Nestor*.

* * *

In connection with the answer given in the last issue to Mr. T. A. Corbett concerning the 4-cylinder 4-4-0 Webb compounds on the L. and N.W.R., converted to simple engines of the "Renown" class, Mr. W. H. Whitworth writes to the effect that these engines at present total 23, as follows:—

1905, *Black Diamond.*
1906, *Robin Hood.*
1913, *Canopus.*
1914, *Invincible.*
1918, *Renown.*
1921, *John O'Gaunt.*
1922, *Intrepid.*
1925, *Warrior.*
1930, *Ramillies.*
1935, *Collingwood.*
1936, *Royal Sovereign.*
1943, *Queen Alexandra.*
1945, *Magnificent.*
1946, *Diadem.*
1948, *Camperdown.*
1949, *King Arthur.*
1951, *Bacchante.*
1957, *Orion.*
1959, *Revenge.*
1960, *Francis Stevenson.*
1961, *Albemarle.*
1965, *Charles H. Mason.*
1971, *Euryalus.*

No. 1929, *Polyphemus*, is still a 4-cylinder compound, but remains the only engine of the class to have a Belpaire firebox, No. 1930, which also had a firebox of this type, having been fitted with a round-topped box when the engine was "simplified." Among other interesting notes, Mr. Whitworth mentions that the numbers of the recent new superheater 0-8-0's built at Crewe are 83, 720,



A HISTORIC LONDON AND NORTH WESTERN RAILWAY ENGINE.
Engineering Department locomotive, *Northampton*, from 1891 to 1902.
Originally No. 366, *Nestor*. Trevithick 6 ft. single.

Digitized by Google

750, 943, 1121, 1129, 1313, 1614, 2082, 2150, 2167, 2172, 2250, 2297, 2343, 2376, 2410, 2412, 2422, and 2441, 20 in all. No. 2122, of the "Claughton" class, has gone from shed 15 to 8, No. 1103 from shed 26 to 1, No. 1085 from shed 1 to 15, and No. 1327 has returned to shed 26. No. 2182, *Giraffe*, a 2-4-0 "Jumbo," has now a curious feature in that its tender wheels are solid. He adds that 20 new non-superheater 0-8-0 engines have been built at Horwich for the Lancashire and Yorkshire Railway, Nos. 927, 1351-4-7, 1365-8-9, and 1586-98, inclusive, together with five new non-superheater 0-6-0's, Nos. 919, 921, 923, and 926. No. 1323, a 2-4-2 tank engine of the same Company, has been rebuilt with Belpaire firebox and extended smokebox.

* * *

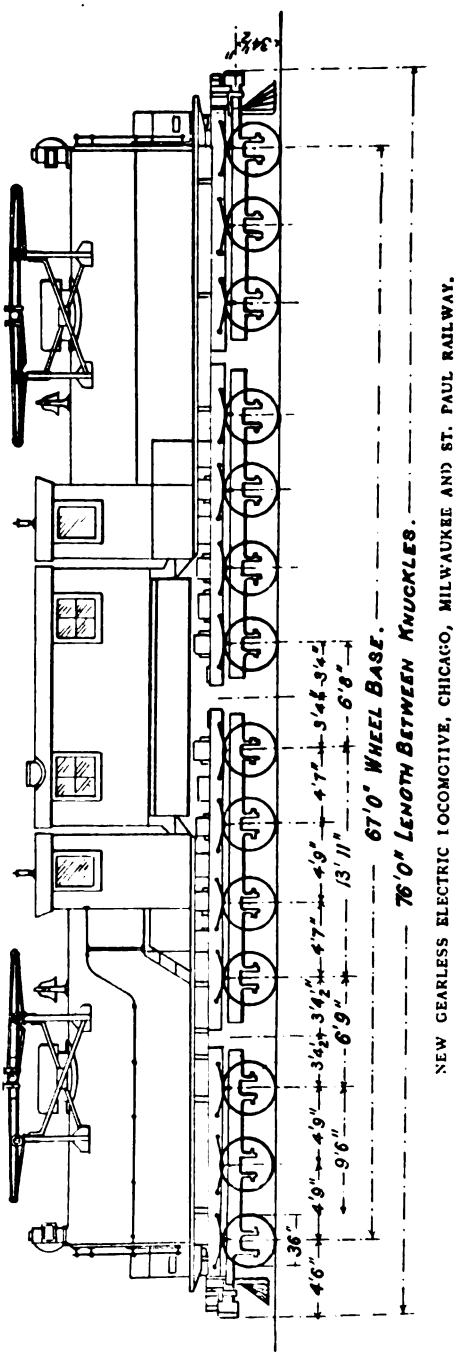
FROM Crewe, Mr. C. Williams writes: As regards the stations of the London and North Western Railway "Claughton" locomotives, the following have been changed recently: 159, 15-1; 1085, 1-15; 1103, 15-1; 1131, 27-15; 1567, 29-15; 2174, 15-1; 2122, 15-8; 2395, 1-8; 2426, 1-15. The Liverpool "Claughtons" now have a turn to Salop, outwards with the 5.30 p.m. goods, and return 10.40 p.m. passenger from Salop. When a "Claughton" is not available for this service, one of the 5 ft. 6 in. 6-wheel-coupled passenger tanks is usually requisitioned. The latest series of 0-8-0 superheater goods engines turned out at Crewe are: Nos. 83, 720, 750, 943, 1121, 1313, 2082, 2167, 2172, and 2412. A further series of the same type is also in hand, the first five being Nos. 1129, 1614, 2150, 2250, and 2297. No. 2118, 4-cylinder compound mineral engine, has been converted to simple with two inside cylinders 20½ in. diameter, and is provided with a superheater. This engine is stationed at Rugby. Several more engines of the "Precursor" type are being superheated, including No. 688, *Hecate*.

* * *

ON page 419 of the June magazine there was reproduced a photograph of a Great Northern Railway coal train hauled by a 2-8-0 type locomotive. This photograph was taken by Mr. R. Hall, and not by the photographer to whom it was last month ascribed. Another of Mr. Hall's collection of Great Northern Railway train photographs appears on page 7 of this issue.

* * *

WRITING to Mr. Edwin J. Miller, hon. sec. Railway Club, a Swiss correspondent remarks: "I am studying the tank engines we now largely use in Switzerland. In these days of coal shortage, this type will do good service. Between Zurich and St. Gall there are only one or two tender locomotives now working, all others being tank engines."



NEW GEARLESS ELECTRIC LOCOMOTIVE, CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY.

Digitized by Google

A CASE that aroused considerable interest in railway circles was recently tried at the London Central Criminal Court before Mr. Justice Darling, when Henry Murray, 58, author, was charged on three counts with publishing a defamatory libel concerning Sir William Francis Marwood, ex-Chief of the Railway Department of the Board of Trade. The genesis of the libel appeared to be the failure of the promoters of the Gattie scheme for a London Central Clearing House for railway goods traffic to get an inquiry into this scheme by the Board of Trade. On the second day of the trial the defendant withdrew the plea of not guilty and the plea of justification. He was fined £100, ordered to pay costs of the prosecution, and also to enter into his own recognisances with a surety in the sum of £500 to be of good behaviour for two years.

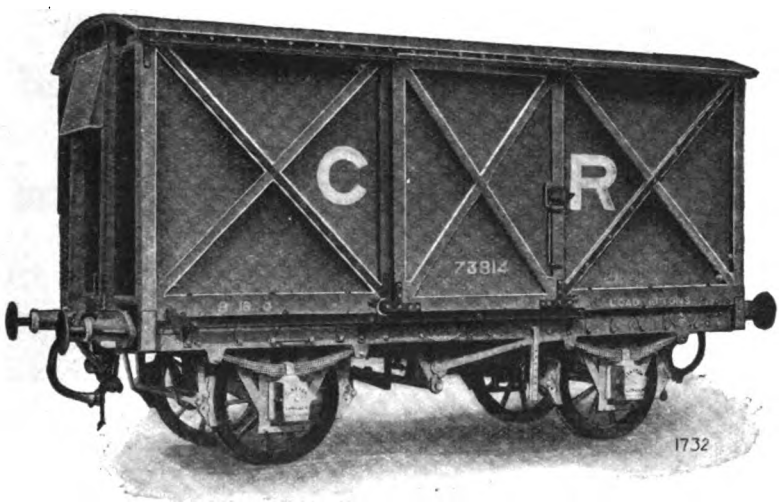
RECENT announcements made by the Leeds Centre of the Institution of Locomotive Engineers includes a visit to the North Eastern Railway works at Darlington on June 25th.

* * *

RAILWAY MAGAZINE readers concerned or engaged in mechanical engineering may like to know of a Metric Conversion Table (Weights) which is being issued by the Hoffmann Manufacturing Co., Ltd., Chelmsford. The firm state they will be very glad to forward a copy of this to any of our readers upon application. The table is a companion to the Linear Metric Conversion Table issued by the same firm some years ago.

* * *

DESPITE the considerably curtailed leisure and a minimum of train and other facilities,



CALEDONIAN RAILWAY 10-TON COVERED GOODS WAGON.
Built by Clayton and Shuttleworth, Ltd., Lincoln.

"RAILWAY Problems After the War" was the subject of Mr. Basil M. Bazley's paper at the June general meeting at the Railway Club, 92, Victoria Street, London, S.W.1. Mr. Bazley's remarks covered a wide field, ranging from locomotive and rolling stock questions to the provision of adequate siding accommodation at country stations. His paper, which was followed with close interest and appreciation by the assembly, showed how keen an observer of railway life and work Mr. Bazley is. On Saturday, July 20th, there is to be a club visit to Sykes' Interlocking Signal Works, Clapham. Members will meet at Clapham Road Station, City and South London Railway, at 2.30 p.m.

resulting from war-time conditions, the Midland Railway Natural History Society, Derby, is still continuing its useful career. During the past year the meetings have been well attended, and have led to much instructive discussion. The rambles, whether near or far afield, have likewise been pleasurable and beneficial.

* * *

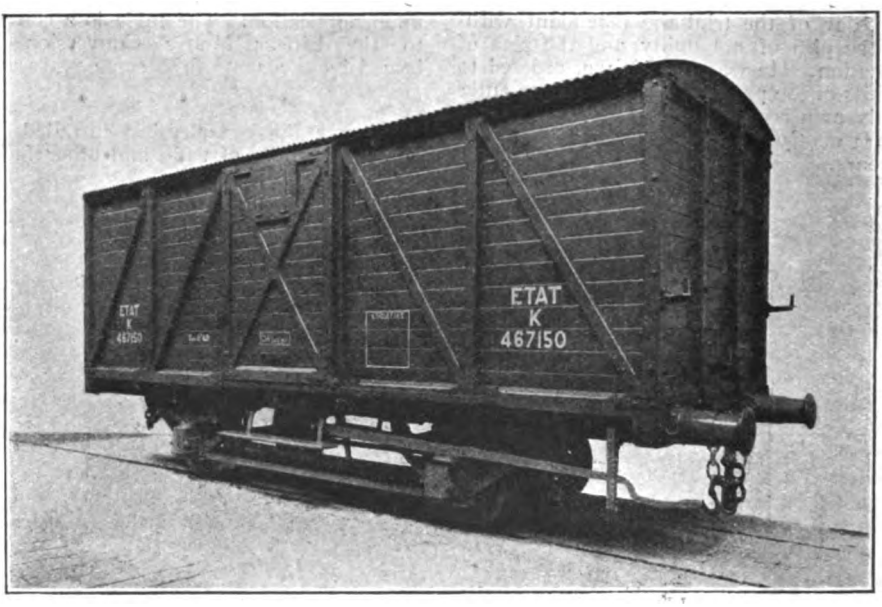
AT King's Lynn the control of the Midland Railway's goods, livestock and mineral work has been taken over by the Great Eastern Railway, and until further notice matters relating to Midland Railway business will be dealt with by the goods agent of the Great Eastern Railway.

Digitized by Google

UNDER the Defence of the Realm Regulations the Board of Trade has made an Order increasing the fares on Irish railways by 50 per cent. The Order provides that on and after June 1st railway companies in Ireland may charge, in addition to the passenger fares contained in the lists exhibited at the stations at that date, a sum equal to one-half of such fares, or, where the fare is not contained in such list, they may charge one-half more than the maximum fare which would be chargeable but for the Order.

IN the House of Commons, Mr. Illingworth (Postmaster-General, in submitting the Estimates for the Post Office on June 12th, mentioned that the mails had been affected by the restrictions of the railway services. He also said that the Post Office (London) Railway promised to be of great value, but that it would be impossible to complete its construction until after the war.

* * *

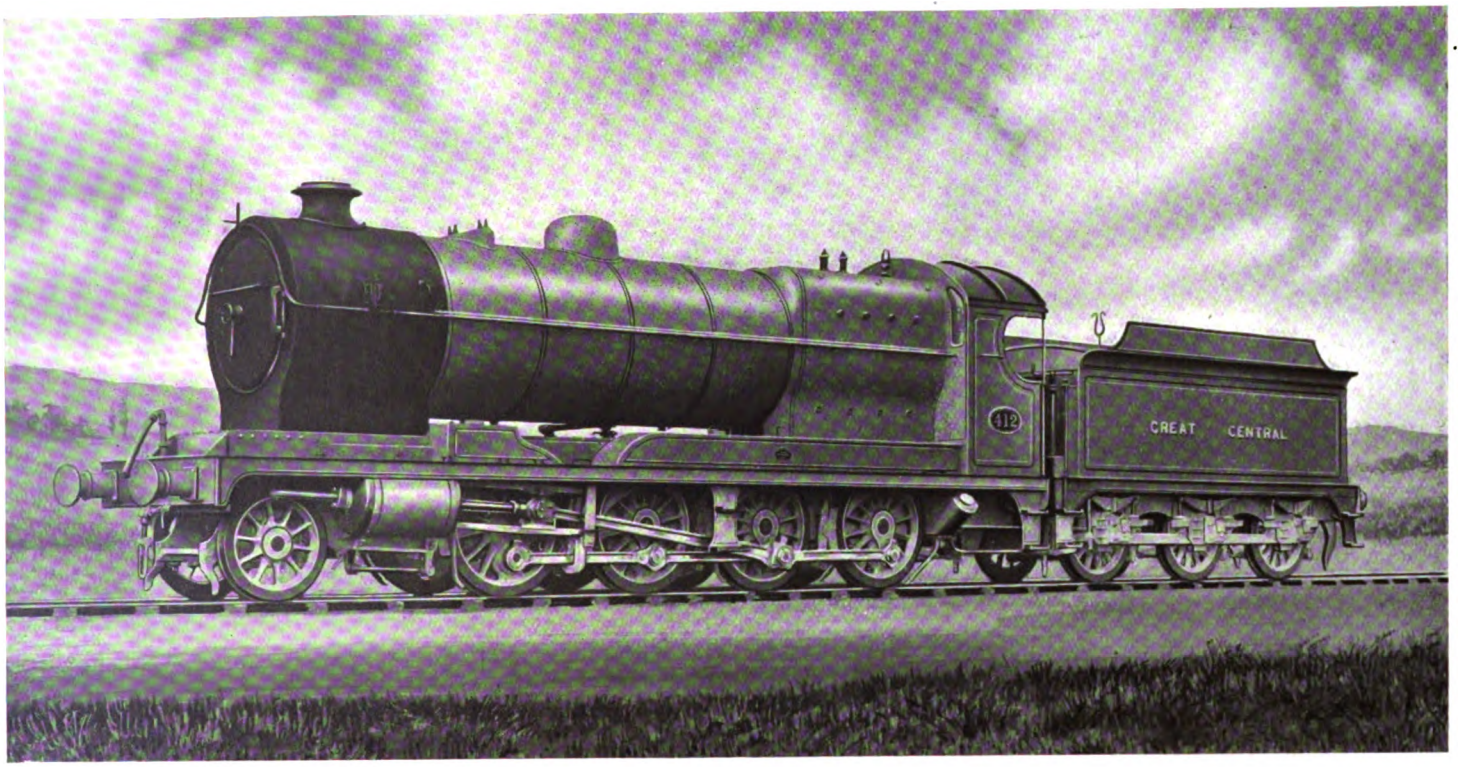


FRENCH STATE RAILWAYS 20-TON COVERED GOODS WAGON.
Built by Clayton and Shuttleworth, Ltd., Lincoln.

FURTHER restrictions have been made in regard to travel to Ireland. The Defence of the Realm Regulation (14 G), which places restrictions on travelling to or from Ireland, has been extended to enable a Secretary of State to prescribe the ports at which passengers from Great Britain to Ireland or from Ireland to Great Britain may embark, and the routes by which they may travel. Where a person embarks at a port in contravention of this regulation, the master of the vessel in which he embarks shall be deemed to have aided and abetted the offence, "unless he proves to the contrary."

Digitized by Google

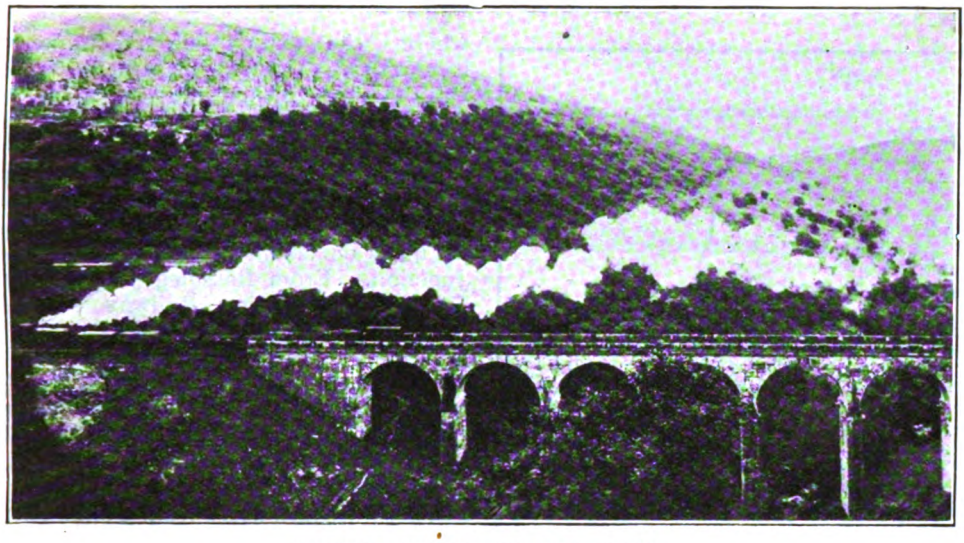
Digitized by Google



GREAT CENTRAL RAILWAY 2-8-0 ENGINE, No. 412.

Designed by Mr. John G. Robinson, Chief Mechanical Engineer.
Cylinders (2): 21 in. diameter by 26 in. stroke. Coupled wheels: 4 ft. 8 in.
Heating Surface: Superheater elements, 308 sq. ft.; Fire tubes, 1,641 sq. ft.; Fire box, 174 sq. ft.; Total, 2,123 sq. ft.
Fire grate, 26 sq. ft. Working pressure: 200 lbs. per sq. in.
Fitted with Robinson Superheater. Weight of Engine and Tender in working order: 123½ tons.

Digitized by Google



PONTSARN VIADUCT, MERTHYR TYDFIL.

The Brecon and Merthyr Railway: Its History and Locomotives.

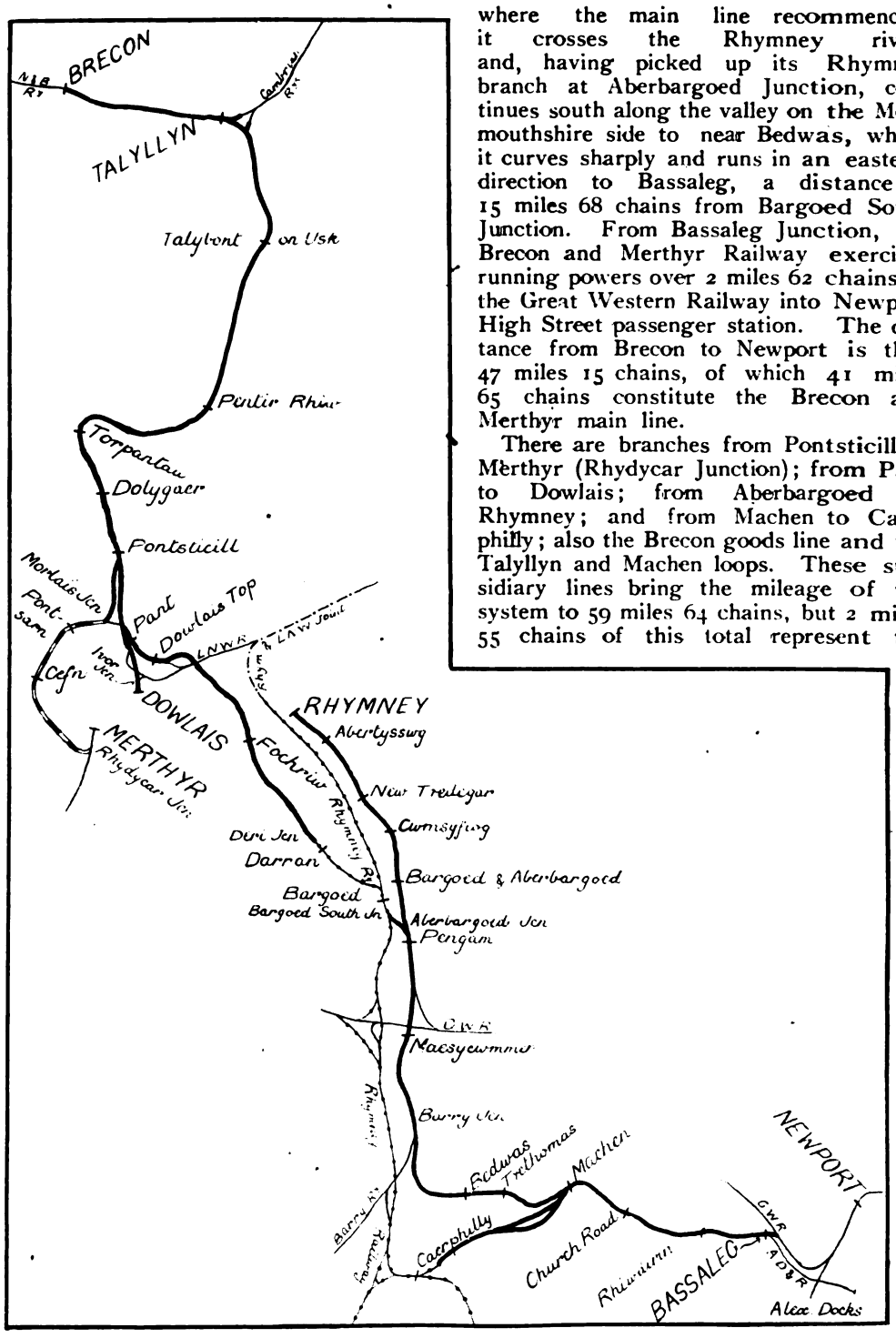
By H. L. HOPWOOD.

IN the counties of Monmouth and Glamorgan there is a veritable maze of railway lines, most of which, running nearly north and south, have as their objective the ports of Newport and Cardiff. These serve the vast coalfields and ironworks of the district, and their position in relation to each other—being, as they are, closely parallel, and intersected by three railways going east and west—is due to the curious physical formation of the country north of Newport and Cardiff. It is a very mountainous district, and the numerous ranges running north and south are divided by deep and narrow valleys. Best known are the valleys named after the Rivers Taff, Rhondda, Rhymney, Sirhowy, and Ebbw; and through them several railways have been made—in many cases on ledges cut in the mountain side.

Hereabouts, the River Rhymney forms the boundary between England and Wales, and along the Rhymney Valley run two railways—the Rhymney on the Welsh side and the Brecon and Merthyr on the English side. The Brecon and Merthyr Railway is the only local system which penetrates north of this district of "railway density," for between Pontsticill and Talyllyn it enjoys an isolated position amidst magnificent scenic surroundings, its nearest neighbours—the Great Western and Neath and Brecon Railways—occupying parallel positions on the east and west sides respectively, but some miles away.

The Brecon and Merthyr Tydfil Junction Railway—to quote its title in full—was incorporated August 1st, 1859, for the construction of railways in the district between Brecon and Merthyr, but in less than ten years from that time the line was extended south towards Newport. The main line now runs from Brecon to a junction with the Rhymney Railway at Deri, a distance of 25 miles 77 chains; and from that point, running powers are exercised over 2 miles 48 chains of the latter railway to Bargoed South Junction. Between Brecon and Deri Junction, the Brecon and Merthyr Railway traverses the Welsh counties of Brecknock and Glamorgan, but at Bargoed South Junction,

Digitized by Google



BRECON AND MERTHYR TYDFIL JUNCTION RAILWAY.

where the main line recommences, it crosses the Rhymney river, and, having picked up its Rhymney branch at Aberbargoed Junction, continues south along the valley on the Monmouthshire side to near Bedwas, where it curves sharply and runs in an easterly direction to Bassaleg, a distance of 15 miles 68 chains from Bargoed South Junction. From Bassaleg Junction, the Brecon and Merthyr Railway exercises running powers over 2 miles 62 chains of the Great Western Railway into Newport High Street passenger station. The distance from Brecon to Newport is thus 47 miles 15 chains, of which 41 miles 65 chains constitute the Brecon and Merthyr main line.

There are branches from Pontsticill to Merthyr (Rhydycar Junction); from Pant to Dowlais; from Aberbargoed to Rhymney; and from Machen to Caerphilly; also the Brecon goods line and the Talyllyn and Machen loops. These subsidiary lines bring the mileage of the system to 59 miles 64 chains, but 2 miles 55 chains of this total represent the

Digitized by Google

BRECON AND MERTHYR TYDFIL JUNCTION RAILWAY.

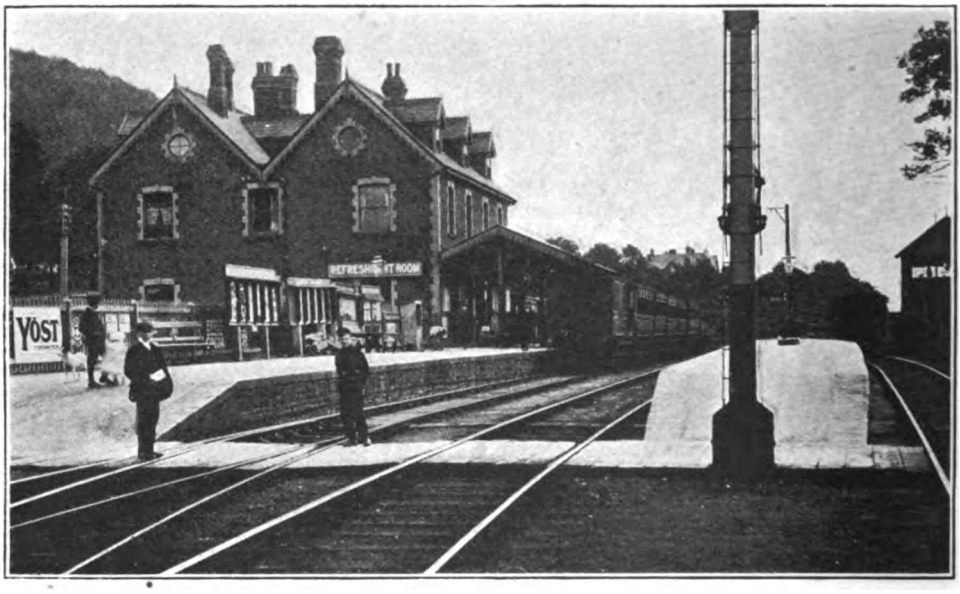
MR. HERBERT RHYS PRICE,
General Manager.

Digitized by Google

Brecon and Merthyr Railway's proportion of lines jointly owned, for the section from Morlais Junction to Rhydycar Junction has been the joint property of the Brecon and Merthyr and London and North Western Railways since 1879, at which date the latter railway reached this district from the direction of Abergavenny.

We have seen that the Brecon and Merthyr Railway received its Act of Incorporation in 1859, and on May 1st, 1863, the line was opened from Brecon to Pant. Between Brecon and Talyllyn, portions of the old Hay Tramroad, dating from 1811, were utilised in construction. In 1862 an extension was authorised from Pant to Deri Junction, and from there to Bargoed South Junction running powers were obtained over the Rhymney Railway, the Brecon and Merthyr Railway having failed to build its own line between those points. The Merthyr branch was also authorised in 1862, and the Dowlais branch in 1865.

In order to reach Newport, the old Rumney Tramroad was absorbed in 1863. This line, which had been opened in 1836, extended from Rhymney to Bassaleg, where it joined the Sirhowy Tramroad. The Rumney Company had obtained powers in 1861 to alter the line and level of its tramroad, and to make a new railway from Machen to Caerphilly, but in the meantime the property was acquired by the Brecon and Merthyr Railway, and the reconstructed lines were brought into use during 1865-67. By these means, the Brecon and Merthyr Railway reached Bassaleg, its present southern terminus; and to get to Newport, it sought and obtained powers from the Monmouthshire Railway to use the latter's Western Valleys line (originally the southern part of the Sirhowy Tramroad) between Bassaleg and Dock Street Station, Newport. When, in 1880, the Monmouthshire Railway was amalgamated with the Great Western Railway, the latter closed the Dock Street (Western Valleys) and Mill Street (Eastern Valleys) passenger stations of the Monmouthshire Railway, and constructed the Gaer loop line, which gave access to the main line; since when Brecon and Merthyr passenger trains have run to and from High Street Station, Newport. The acquisition of the Rumney Tramroad was the most important event in the history of the Brecon and Merthyr Railway, for without this line, which serves important collieries and ironworks, the Company would have



Photo] [*O. Jackson.*

BRECON STATION.

Digitized by Google

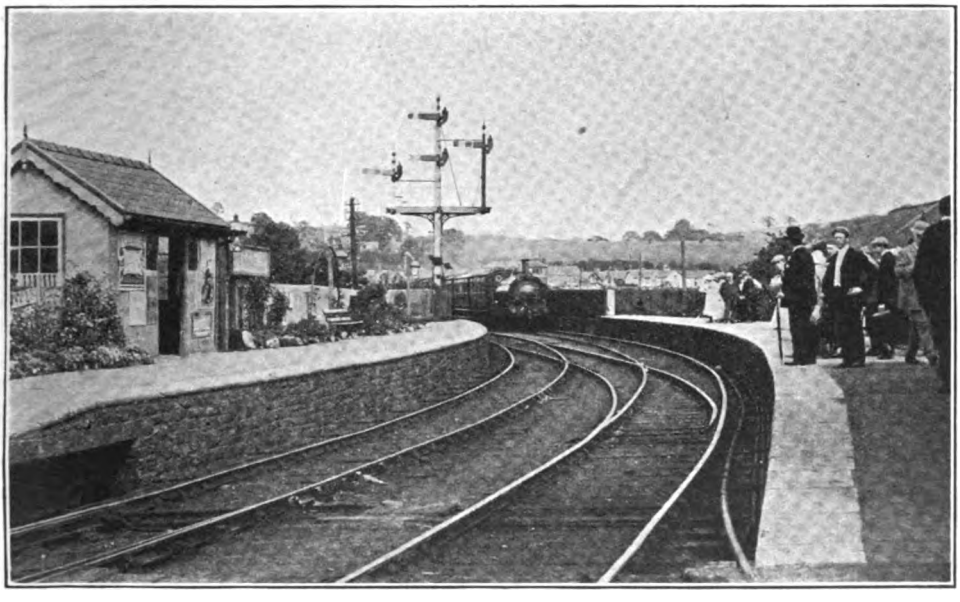
been unable to develop its system to any great extent.

As various sections of the railway were opened at different times, it will be as well to give the dates in tabulated form as under :—

Section.	Date opened.
Main Line—	
Brecon to Pant	May 1st, 1863.
Pant to Dowlais Top ...	August 1st, 1867.
Dowlais Top to Pengam.	September 1st, 1868.
Pengam to Bassaleg ...	June 14th, 1865.
Rhymney Branch—	
Rhymney to Pengam ...	April 16th, 1866.
Merthyr Branch—	
Pontsticill to Cefn	August 1st, 1867.
Cefn to Merthyr	August 1st, 1868.
Dowlais Branch—	
Pant to Dowlais	June 23rd, 1869.
Caerphilly Branch & Machen Loop—	
Machen to Caerphilly ...	1867.
Machen to Gwernydomen..	Sept. 14th, 1891.

tion. The object of the loop was to ease the gradient from 1 in 39 to 1 in 200.

For a few years during the 'sixties, the Brecon and Merthyr Railway worked the neighbouring Hereford, Hay and Brecon Railway. The latter was a resuscitation of the old Hay Tramroad, one part of which—from Brecon to Talyllyn—had been transferred to the Brecon and Merthyr Railway, and another to the Mid-Wales Railway; whilst a third part had been abandoned. As constructed under an Act of 1859, the Hereford, Hay and Brecon Railway extended from Hereford to Three Cocks Junction on the Mid-Wales Railway. A few engines built for the Hereford, Hay and Brecon Railway in 1865 passed into the locomotive stock of the Brecon and Merthyr Railway, who, as already mentioned, worked the line until the end of 1868. The Mid-



BASSALEG STATION.
Great Western Newport-Pontypridd train approaching.

Through rail communication between Brecon and Newport was thus established September 1st, 1868.

The Machen loop line was promoted and constructed by the Pontypridd, Caerphilly and Newport Railway, and became part of the Brecon and Merthyr system in consideration of the former company receiving in perpetuity a moiety of the earnings of the Machen-Caerphilly sec-

Wales Railway then undertook the working for nine months, and was in turn succeeded by the Midland Railway, who finally absorbed the Hereford, Hay and Brecon Railway into its own system.

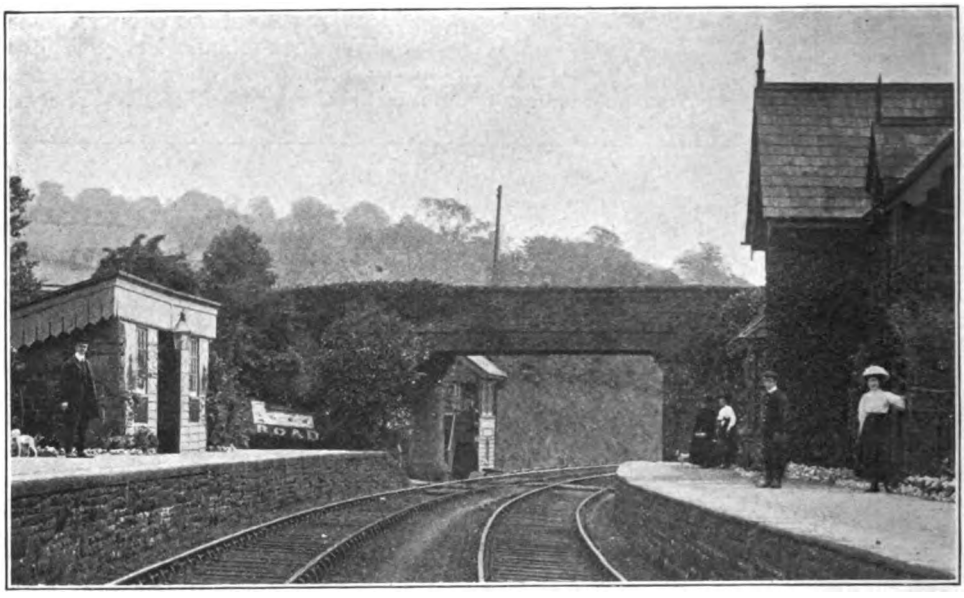
The Brecon and Merthyr main line is single track from Brecon to Deri Junction; thence it is double all the way to Bassaleg. The Rhymney branch is double, except the last section of 1 mile

Digitized by Google

10 chains between Abertysswg and Rhymney. All other branches are single, although the Caerphilly branch is virtually a double line from Machen to Gwernydomen, as between these points up trains use the original single line, and down trains the more recently opened Machen loop. During the summer of 1916 a serious landslide occurred on the Rhymney branch near New Tredegar which blocked one road and made single line working a necessity. The movement has now almost ceased, and it is expected that the down road will be brought into use again some time during 1918.

The mountainous nature of the country is responsible for the construction of many embankments and cuttings, tunnels at Talyllyn and Torpantau, and two long stone viaducts on the Merthyr branch at Pontsarn and Cefn. Apart from these, and the Talybont incline, there are no engineering works that require special mention.

Owing to the extreme severity of its gradients, the Brecon and Merthyr Railway is necessarily an expensive line to operate. On leaving Brecon, the average rise is about 1 in 100 to Talyllyn Junction; from there to Talybont the line falls nearly all the way at 1 in 40, and then follows one of the longest and steepest gradients in the country—the celebrated Talybont incline, rising at 1 in 38 for 7 miles to Torpantau tunnel. Talybont is 385 ft. and Torpontau 1,310 ft. above sea level, a rise of 925 ft. in 7 miles. Between Dowlais Top and Fochriw occurs the summit of the railway, 1,314 ft. above sea level; thence the line falls at 1 in 40, 65, 75, 110, etc., to Bassaleg. Coming from Merthyr, there is a steep rise, mostly at 1 in 50, to Pontsticill. The Rhymney branch falls the whole way at 1 in 96, 98, and 99 from Rhymney to Aberbargoed Junction. The Dowlais branch rises principally at 1 in 80 to the junction with the main line at Pant. On leaving Machen for Caerphilly there is a fall at 1 in 39 for nearly a mile.



CHURCH ROAD STATION LOOKING TOWARDS NEWPORT.

Generally speaking, station accommodation does not rank high, but at several places, *e.g.*, Brecon, Talyllyn, Talybont, Pengam, Church Road, and Rhiwderin, stone buildings, quite up to the usual roadside standard, are provided. At Brecon there are four platform faces, and at Pontsticill there is an island platform on the up side, through trains from Merthyr to Brecon using the outer face. The Dowlais branch joins the main line north of Pant Station; consequently, branch trains have to "back shunt" in order to

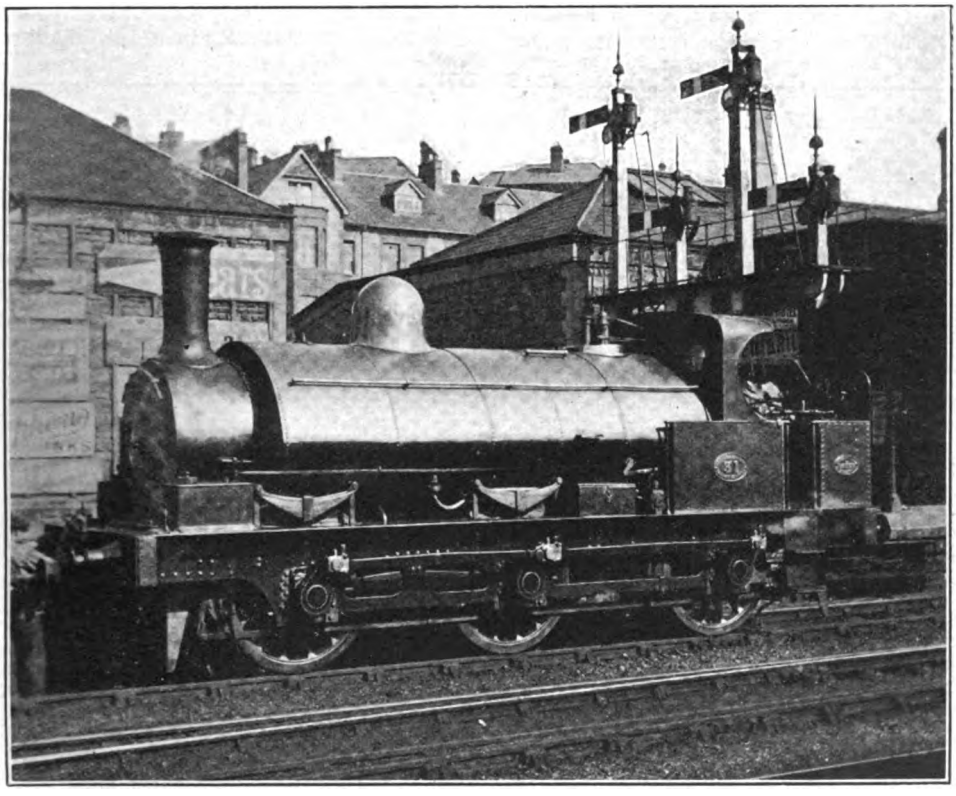
Digitized by Google

get from the branch to the platform, and vice versa. Brecon and Merthyr trains use the Great Western stations at Newport and Merthyr. The latter station, designed by Brunel, is quite cosmopolitan in character, the trains of the five companies—*i.e.*, Great Western, London and North Western, Taff Vale, Rhymney, and Brecon and Merthyr—using it.

Junctions between the Brecon and Merthyr and other systems are effected at various places as follows :—

Railway.	At
Lon. and N.-W...	Dowlais Top, Morlais Junction, Ivor Junction.
Great Western ...	Merthyr, Maesycwmmer, Bassaleg.
Cambrian	Talyllyn.
Taff Vale	Merthyr.
Rhymney	Caerphilly, Bargoed, Deri.
Barry	Barry Junction.
Neath & Brecon.	Brecon.
Alexandra Docks and Railway....	Bassaleg.

There is a marked contrast between the northern and southern sections of the system, both as regards scenery and character of traffic. The dividing line would appear to be at Pant, as north of that station the railway passes through a district noted for the magnificence of its mountain, river and lake scenery, and passenger traffic is chiefly of a tourist nature in the season. Scenic effects on the Merthyr branch are also very fine until approaching the town of Merthyr; but the same cannot be said of the Dowlais and Rhymney branches, where the railway is situated in a coal and iron producing district, and it would be difficult to picture a more desolate neighbourhood; collieries, iron and steel works and slag heaps dominating everything. In travelling south from Pant along the main line, matters are not much better until the Rhymney Valley is left and Bedwas Colliery passed; but after that there is a marked improvement in the surroundings,



Photo] [*H. L. Hopwood.*

0-6-0 SADDLE TANK ENGINE, NO. 31.

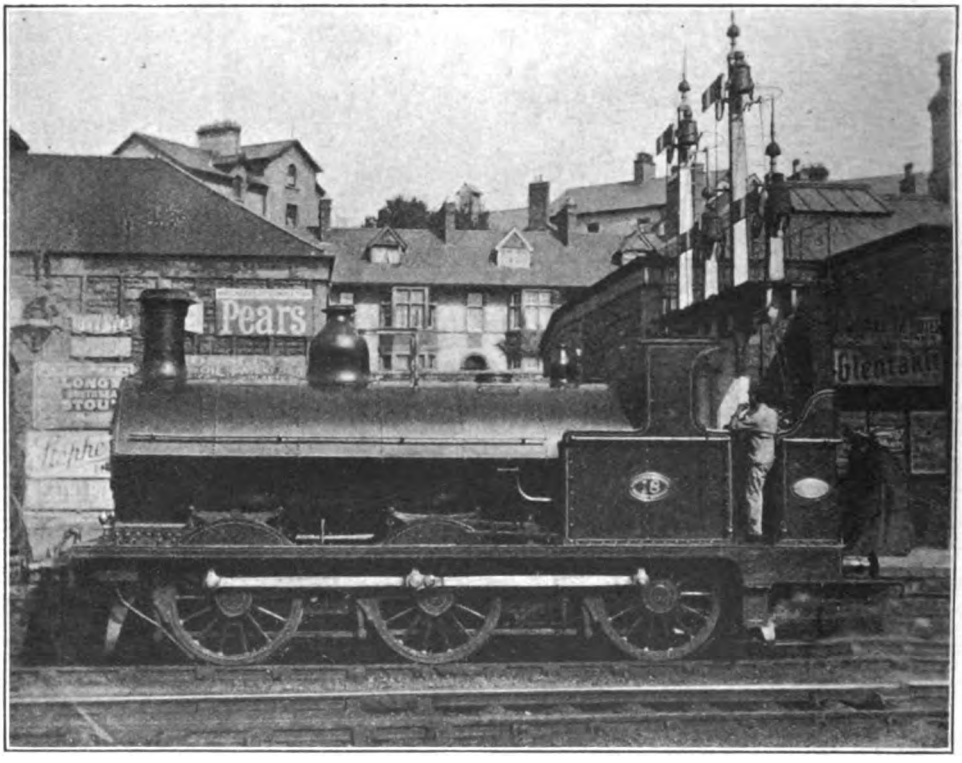
Digitized by Google

which continues until nearly the end of the journey.

In conjunction with the Taff Vale, Rhymney, and Cambrian Railways, the Brecon and Merthyr Railway forms the natural route from Cardiff, Newport, Merthyr and Rhondda Valley stations to Mid-Wales and North Wales, and before the war some thousands of passengers were annually carried this way to Llandrindod and Llanwyrtyd Wells, as well as to the Cardigan Bay health resorts.

During the summer months in normal times through coaches were run between South Wales towns and Aberystwyth viâ the Mid-Wales line of the Cambrian Railways. North-bound coaches left Cardiff (Taff Vale) at 10.20; Cardiff (Rhymney) at 10.35; and Treherbert at 10.15 a.m. These sets then left Merthyr as one train at 11.40, and were hauled by a Brecon and Merthyr engine. The train was advertised to run from Cefn to Builth Wells without a stop, but, actually, it stopped at Talyllyn South to change engines; a Cambrian engine, which had come light from Brecon, taking the train forward to Aberystwyth, where it was due at 4.15 p.m. A few years ago a Cambrian engine used to be stationed at Merthyr to work this train, and the stop at Talyllyn was thus avoided. This arrangement brought about an unusual instance of "foreign" working, viz., a Cambrian engine hauling Taff Vale coaches over the Brecon and Merthyr line; for the Taff Vale Railway provided the carriages that worked to and from Queen Street Station, Cardiff.

In the opposite direction, the train was due from Aberystwyth at 9.35 a.m., and after leaving Builth Wells made its first advertised stop at Pontsticill—although it actually stopped at Talyllyn South to change engines. At Pontsticill the train was divided, a coach for Newport going forward at 2.3 and reaching its destination at 4.0 p.m. The other portion of the



Photo] [*H. L. Hopwood.*

0-6-0 SADDLE TANK ENGINE, NO. 18.

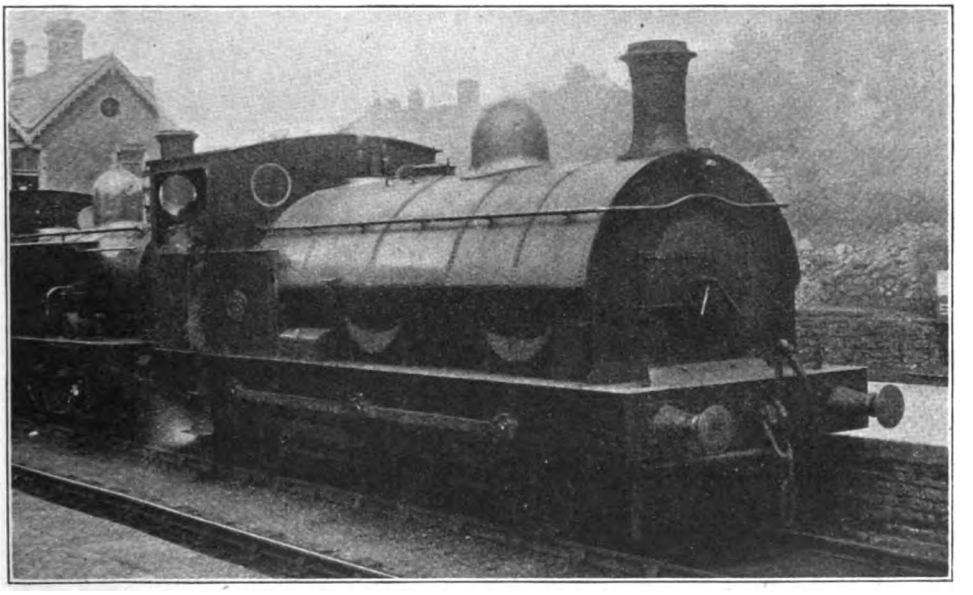
Digitized by Google

train was due Merthyr at 2.45; Treherbert at 4.16; Cardiff (Rhymney) at 4.35; and Cardiff (Taff Vale) at 4.47 p.m. "Bradshaw" gave the times of these trains at Talyllyn, and added the following note: "Runs via the loop at Talyllyn, and does not set down or take up passengers at the station." As Brecon and Merthyr time-tables gave no Talyllyn times, and passengers on the platform could not avail themselves of the trains, the note seemed rather superfluous. These trains ran (in a slightly modified form) during the summer of 1916, but have since been suspended.

There are at present seven Brecon and Merthyr trains into and out of Newport daily, four of which have through connections to and from Brecon. This is a reduction upon the pre-war service of two trains each way.

Previous to January 1st, 1917, stations between Newport and Machen were also served by Great Western trains (four each way) that ran the Pontypridd, Caerphilly, and Newport service of the Alexandra Docks and Railway. These travelled viâ Machen and Caerphilly, and it is curious to notice that the Brecon and Merthyr Railway itself runs no passenger trains over this section of its line. The Pontypridd, Caerphilly, and Newport service was suspended on January 1st, 1917, and in its place the Alexandra Docks and Railway Pontypridd-Caerphilly rail motor was extended to Machen, there to connect with Brecon and Merthyr trains to and from Newport.

Punctual working is rendered difficult by reason of the fact that the Brecon and Merthyr Railway is dependent at its northern end upon connections of the Midland and Cambrian Railways, these Companies having only single line approaches to the junction. Both Midland and Cambrian trains run forward over the Brecon and Merthyr Railway, and this causes the single line section between Talyllyn and Brecon to be very congested. At Newport there is great density of traffic, and trains are bound to suffer delay; although matters have improved somewhat of late, due to the duplication of Hillfield tunnel in 1912.



Photo] [*Locomotive Publishing Co., Ltd.*

0-6-0 SADDLE TANK ENGINE NO. 28.

The earliest locomotives of the Brecon and Merthyr Railway were chiefly 0-6-0 saddle tanks supplied by Sharp, Stewart and Co. Later on, a few tender engines were added to the stock. Of these, there were two 2-4-0 and two 0-6-0 engines taken over from the Hereford, Hay and Brecon Railway; also two 0-6-0 engines

Digitized by Google

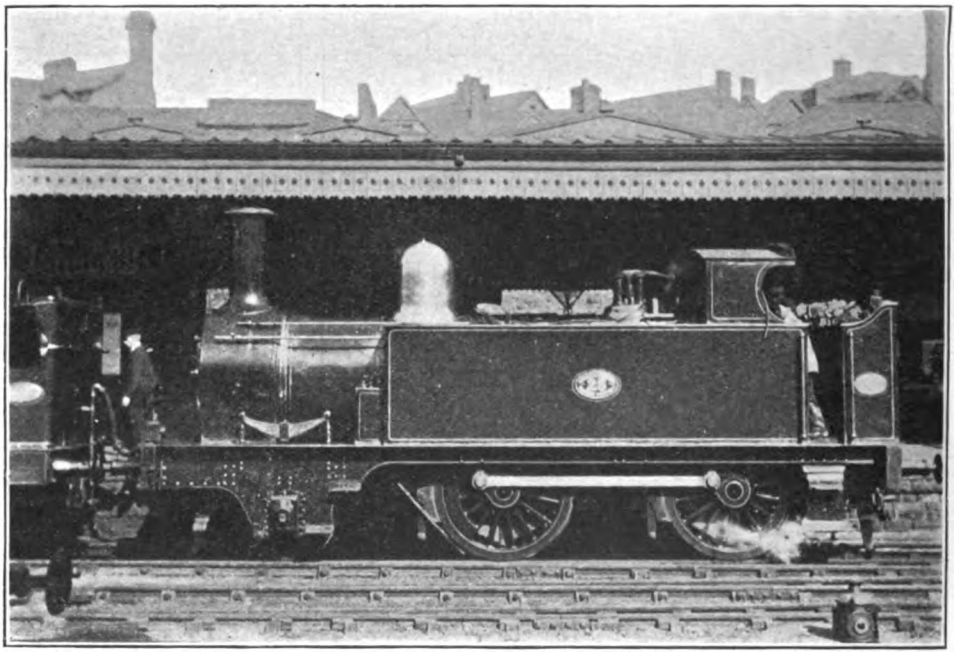
from the Rumney Company. These six locomotives were of Sharp, Stewart and Co.'s standard pattern of the period, the passenger engines having 15 in. by 20 in. cylinders and 5 ft. 6 in. wheels, and the goods engines 16 in. by 24 in. cylinders and 4 ft. 6 in. wheels. The 2-4-0 tender engines were subsequently converted into side tanks. All early engines were distinguished by names.

At present 41 engines are in use, including 24 0-6-0 saddle tanks; 11 0-6-2 side tanks; one 2-4-0 side tank; four 0-6-2 saddle tanks; and one 4-4-2 side tank. The 24 0-6-0 engines are divided into four classes, the oldest being illustrated by the photograph of engine No. 31. Incidentally, Nos. 30 and 31 are the oldest engines now running, having been built in 1874 for the Neath and Brecon Railway, and sold three years later to the present owner. This class, which has cylinders 17 in. by 24 in. and wheels 4 ft. 2½ in. in diameter (except Nos. 30 and 31, which have 4 ft. 7 in. wheels), is numbered as follows, the list being arranged numerically, and not in the order of building :—

Numbers.	Builders.	Builder's numbers.	Date.
1...	John Fowler and Co. ...	4995	1885
2...	Do. do. ...	4996	„
3...	Do. do. ...	5054	„
4 ..	Do. do. ...	5055	„
5...	R. Stephenson and Co.	2498	1884
6...	Do. do. ...	2447	„
7...	Do. do. ...	2448	„
8...	Do. do. ...	2497	„
13...	John Fowler and Co. ...	5056	1885
14...	Do. do. ...	5057	„
15...	R. Stephenson and Co.	2499	1884
16...	Do. do. ...	2500	„
30...	Avonside Engine Co. ...	1013	1874
31...	Do. do. ...	1014	„

There are only two engines of the class represented by the photograph of No. 18, the sister engine being No. 17. They were built in 1881 by Sharp, Stewart and Co. (their numbers being 2975 for 17, and 2974 for 18), and have 17 in. by 24 in. cylinders and 4 ft. 6 in. wheels.

A very sturdy looking class is that shown by the photograph of No. 28. There are five of these engines; Nos. 22, 24, 27, 28, and 29. The first two were built in 1896 by Kitson and Co. (works numbers 3668 and 3667); and in 1900 Nasmyth, Wilson and Co. delivered Nos. 27 to 29 (works numbers 584-6).



Photo] [*H. L. Hopwood.*

2-4-0 SIDE TANK ENGINE, NO. 25.

Digitized by Google

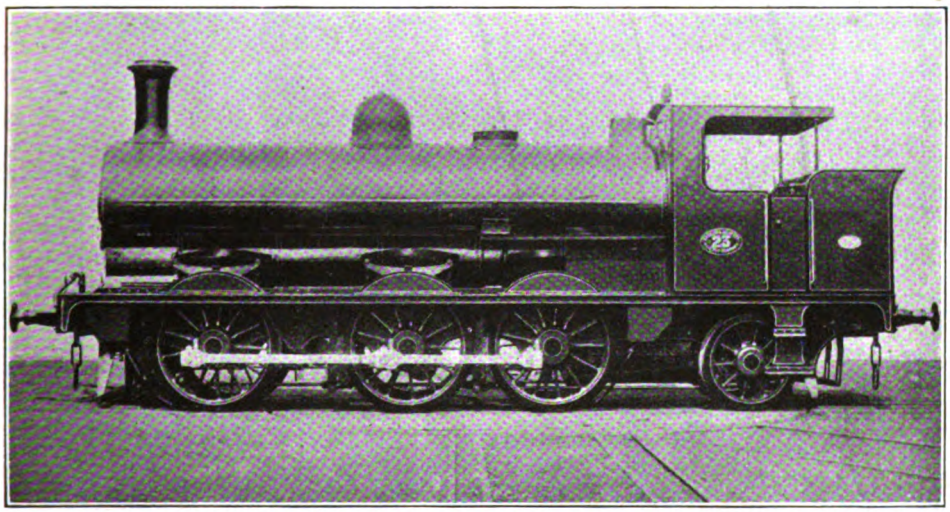
Cylinders are 17 in. by 24 in. and wheels 4 ft. 7½ in. in diameter, the wheelbase being 15 ft. 8 in. There is a total heating surface of 1,110 sq. ft.; whilst the grate area is 15¼ sq. ft.; the working pressure 160 lb.; and the total weight 49 tons 14 cwt.

The fourth lot of 0-6-0 engines comprises three saddle tanks, purchased from the Great Western Railway in 1906 and 1907; and as this class of Great Western engine is so well known, it does not require to be illustrated. The engines are numbered 32 to 34 in the Brecon and Merthyr stock, and were formerly Great Western Nos. 1685, 1693, and 1694 respectively, built at Swindon in 1887. enough to deal unassisted with modern loads over such a steep road as the Brecon and Merthyr has, five of them have been condemned.

One of the four 0-6-2 saddle tanks is illustrated by the photograph of engine No. 23. These were built by the Vulcan Foundry Company—Nos. 23 and 26 in 1894 and Nos. 19 and 20 in 1905 (makers' numbers 1405-6 and 2040-1 respectively)—and have the following dimensions :—

Cylinders, 17in. by 24in.	Heat. surface, 1170 sq. ft.
Wheels, c'pled, 4ft. 7½in.	Work. pressure, 150 lb.
„ trailing, 3ft. 6in.	Grate area, 14.5 sq. ft.
Tot. wheelbase, 19ft. 4in.	Water capacity, 1,100 gallons.

Nos. 23 and 26 have the cabs open at



Photo] [*Vulcan Foundry.*

0-6-2 SADDLE TANK ENGINE, NO. 23.

They have cylinders 17 in. by 26 in. and wheels 5 ft. in diameter.

Engine No. 25 illustrates the 2-4-0 passenger side tank, of which six were built, all by R. Stephenson and Co., and numbered as follows :—

Numbers.	Makers' Nos.	Date.
9 and 10	2656-7	1888
11 and 12	2658-9	1889
21	3121	1904
25	2878	1898

These engines had 16 in. by 24 in. cylinders; 3 ft. 6 in. leading wheels and 5 ft. coupled wheels. Hardly powerful the back, the roofs being supported by side pillars; but in Nos. 19 and 20 the cabs are provided with rear weatherboards.

The 0-6-2 side tanks, all built by R. Stephenson and Co., are quite modern, Nos. 36 to 39 (makers' numbers 3379-82) being dated 1910; and Nos. 40 to 43 (makers' numbers 3577-80), 1914. They are represented by the illustration of No. 43. An improved form of this class came out in 1915—Nos. 45 to 47 (makers' numbers, 3645-7)—and was illustrated on page 403 of the June, 1917, RAILWAY MAGAZINE. For purposes of comparison,

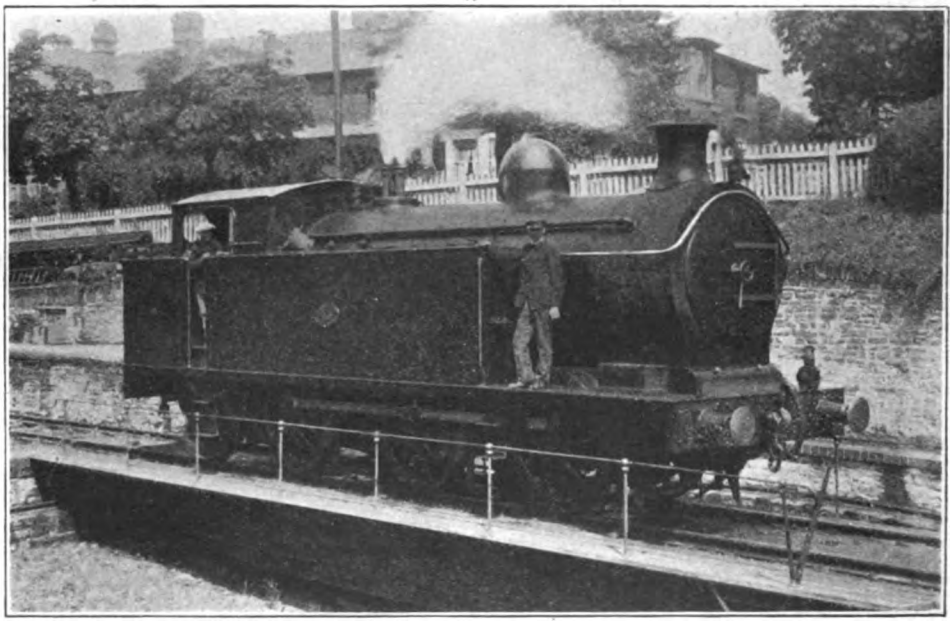
Digitized by Google

dimensions of these two classes are given in tabulated form as under :—

	Nos. 36 to 43.	Nos. 45 to 47.
Cylinders	18½in. by 26in.	18in. by 26in.
Wheels, diameter of coupled	4ft. 6in.	5ft.
Do. trailing	3ft. 6in.	3ft. 6in.
Wheelbase... ...	21ft. 9in.	21ft. 9in.
Heating surface:		
Tubes	1,296 sq. ft.	1,227 sq. ft.
Firebox	123.5 „	100 „
Total	1,419 5 sq. ft.	1,327 sq. ft.
Grate area... ..	21.5 „	18 „
Working pressure	175 lb.	175 lb.
Water capacity...	1,740 gallons.	1,300 gallons.
Total weight ...	66 tons 19 cwts.	61 tons.

There are 100 coaching vehicles; about two-thirds of which are four-wheelers, and the remainder six-wheeled carriages that formerly ran on the London and South Western Railway. Some of the four-wheelers working on the Dowlais branch must be nearly 50 years old; others are those purchased from the Mersey Railway when that railway changed from steam to electric traction.

The Talybont incline has already been referred to; and many years ago this was the scene of an unusual accident. On December 2nd, 1878, a goods and mineral



Photo] [*Locomotive Publishing Co., Ltd.*

0-6-2 SIDE TANK ENGINE, NO. 43.

The remaining engine to be described is No. 44, a 4-4-2 side tank, purchased from the London and South Western Railway in 1914. On the latter railway the engine was numbered 0376, and was originally built by Beyer, Peacock and Co. in 1879 (makers' number 1840). It is of the late Mr. W. Adams' design, and has 18 in. by 24 in. cylinders and 5 ft. 7 in. wheels.

No. 35 is a blank number, the engine formerly bearing this number having been sold in 1916 to the Cramlington Colliery. It was a 4-4-0 engine, and originally belonged to the Great Western Railway (No. 1490, built 1898).

train got out of control when descending the 7-mile bank, and attaining very high speed, ran off the road and down the embankment near Talybont station. The train consisted of 22 wagons of coal, three of goods, 11 empties, and brake van; and was worked by three 0-6-0 saddle tank engines; "Hercules" in front; "Atlas" next the train; and "Severn" in the rear; the aggregate weight of the whole being 397 tons. Two drivers and two firemen were killed, and the whole of the train was wrecked.

For many years the Brecon and Merthyr Railway suffered from its financial burdens, but with growing traffic

Digitized by Google

receipts, due to the recent opening up of several additional collieries adjacent to the line, there is every indication that the future of the railway will be brighter than its past has been.

Mr. Herbert Rhys Price, General Manager of the Brecon and Merthyr Railway, is a native of Brecon, being the fourth son of the late Rector of Llanfrynach. He joined the service as a boy clerk in 1875. He became Registrar, and in 1889, at the age of 28, was appointed Secretary. In 1903 he took over the duties of General Manager, in addition to those of Secretary, and it is only since the war that he has been relieved of the latter office.

Mr. Price attributes his successful career to the early training received in the office, and under the immediate direction, of the then Secretary of the Company, Mr. Walter Thompson, a gentleman of the highest character, education and business attainments.

The Brecon and Merthyr has always suffered from the want of capital, and improvements have consequently been difficult to carry out, but since 1903 the Company has not stood still. Both the rolling stock and permanent way have been greatly improved, the line having been relaid with 80 lb. and 90 lb. rails throughout, while the Brecon and Merthyr 0-6-2 class of tank engine is as fine as any in the country.

Prior to the recent drastic changes, the passenger train service had been much improved and accelerated.

Land has been purchased, and the accommodation at stations in the Rhymney Valley greatly increased, while the Company's shops at Machen have been enlarged, and the railway diverted so as to get rid of the intersection of same.

The following figures show the progress made in the ten years anterior to the war :—

	1903.	1913.
Gross receipts ...	£104,976	£146,499
Net income	38,181	58,252

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

Digitized by Google

Locomotive and Train Working in the latter part of the 19th Century.

GREAT EASTERN RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN 1876-7 Mr. Adams, who had succeeded Mr. Johnson a few years before, began to find that some of the express trains were becoming too heavy for the Sinclair singles. He built 20 heavy 6 ft. 4-4-0 outside cylinder engines, which, I believe, were originally intended for heavy passenger work, but for some reason they were not brilliantly successful on fast trains, and were soon relegated to express goods traffic. Then 20 of the Sinclair goods engines were taken in hand, rebuilt with new boilers and leading bogies,* and set to work as express passenger engines, on which duty they did very good service. These engines had 17 in. by 24 in. cylinders, 6 ft. 1 in. coupled wheels (increased later to 6 ft. 3 in. by the use of thicker tyres), and 140 lb. pressure, and the motion of the old Sinclair engines was altered to the arrangement with single slide bars, which has since been so much used on this railway.

These engines were stationed as follows :—

Stratford.—308, 312, 314, 317, 327, 329, 342, 381, 412, and 416.
Cambridge.—360 and 385.
Ipswich.—325.
Yarmouth.—349, 366, 370, and 406.
Norwich.—311, 320, and 324.

Nos. 406 and 416 were generally on the Yarmouth and London through expresses, and 342 was for a long time on the 12.3 p.m. express from St. Pancras to Ely. The following is a run with this engine and train made in 1878. Load, nine coaches :—

Miles.					
	St. Pancras	... dep.	12	3	Signal slacks at Camden Town.
	Kentish Town.	pass.	12	12	
6¼	Tottenham	... „	12	20¾	
10¼	Ponders End	... „	12	26	
13	Waltham...	... „	12	29¼	
14¼	Cheshunt...	... „	12	30¾	
17¼	Broxbourne	... „	12	34	Slack.
20¼	Roydon	... „	12	38	

* See illustration of No. 412 on page 12 of July No.

Miles.					
23	Burnt Mill	.. pass.	12	41	
24¾	Haslow	... „	12	43	
30¾	Bishops Stortf'd	„	12	50½	Slack.
33¾	Stanstead	... „	12	54½	
35½	Elsenham	... „	12	57¾	
40¼	Newport	... „	1	3	
42	Audley End	... „	1	5	
46	Gt. Chesterford.	„	1	9½	
49¼	Whittlesford	... „	1	13½	
52¾	Shelford	... „	1	17	
56	Cambridge	... arr.	1	21½	
	„	... dep.	1	28½	
61¼	Waterbeach	...pass.	1	36	
70¾	Ely	... ... arr.	1	48	

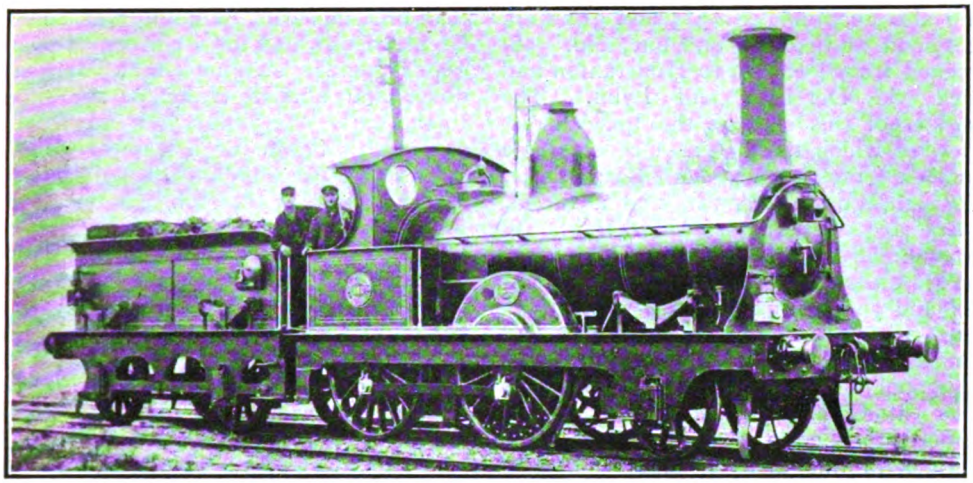
The time from Tottenham (pass) to Cambridge (arr.), 49¾ miles, was 60¼ min., a running average of nearly 49.1 miles per hour, by no means a bad performance, especially when the 1 in 130 rise at Elsenham is taken into account.

These engines also rendered a very good account of themselves with heavy trains, as the following runs* made in 1886-7 on the 10.24 a.m. express from Bishops Stortford to London will show. This train was booked to run the 30½ miles to Liverpool Street in 46 min., a speed of just 40 miles per hour, but it was very heavily loaded. In both cases four coaches were slipped at Tottenham :—

	Engine 324 & 17 coaches.		Engine 415 & 16 coaches.	
	Time.	Speed, m.p.h.	Time.	Speed. m.p.h
Bishops Stortford...dep.	10.31.20		10.26.45	
Post 29...	34 55	40.4	30.1	
„ 28.	36.24	45.6	31.43	35.3
„ 27...	37.43	46.7	33.6	43.3
„ 26...	39.0	48.	34 23	46.7
„ 25	40.15	50.	35.38	48.
„ 24...	41.27	53.7	36.50	50.
„ 23...	42.34	53.7	37.55	55.3
„ 22...	43.41	54.5	39.0	55.3
„ 21...	44.47	53.7	40.5	56.2
„ 20...	45.54	52.9	41.9	58.1
„ 19...	47.2	51.4	42.11	56.2
„ 18...	48.12		43.15	

* For these and one or two of the runs of other engines mentioned subsequently I am indebted to my friend formerly in the G.E.R. locomotive department.

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

2-4-0 PASSENGER ENGINE, NO. 160.

No. 1 Class designed by S. W. Johnson. Built by Sharp, Stewart and Co., 1867-1871. Wheels, 5 ft. 7 in. Cylinders, 16 in. by 22 in

	Engine 324 & 17 coaches.		Engine 415 & 16 coaches.	
	Time	Speed, m.p.h.	Time.	Speed, m.p.h.
Broxbourne (13 miles 24 ch. from Stortford)	10.49.15	51.	10.14.15	54.1
Post 16...	50.33		45.28	
„ 15...	51.41	53.7	46.36	52.9
„ 14...	52.48	53.7	47.43	53.7
„ 13...	53.54	54.5	48.50	53.7
„ 12...	55.1	53.7	49.59	52.1
„ 11...	56.9	52.9	51.8	52.1
„ 10...	57.17	52.9	52.16	52.9
„ 9...	58.23	54.5	53.25	52.1
„ 8...	59 31	53.7	54.35	51.4
„ 7...	11.0.41	51.4	55.48	49.3
Tottenham	1.50		57.5	
Hackney Downs... ...	6.45		11.2.50	
Liverpool Street (30 m. 30 ch.)	11.13.30		11.10.0	
Time gained	3 m. 50 s.		2 m. 45 s.	
Aver. speed to Hackney Downs	46.4 m.p.h.		45.9 m.p.h.	

Of the engines of this class, one, No. 381, was used only for goods trains, as it was not fitted with a continuous brake. The others saw several changes of stations, and when the joint line was opened 314, 349, and 370 were transferred to Lincoln to work over it; 327 became Tottenham pilot, and was to be seen every day at St. Pancras; whilst 406 became Liverpool Street pilot, for which duty it was specially painted, and all the bright parts beautifully polished. All of them were broken up between 1889 and 1893.

When these engines came out as passenger engines, the brake question was under consideration, and several brakes were tried. Six of the class were fitted with Smith's simple vacuum brake, amongst which was 416 on the Yarmouth trains. 406, on the other hand, was one of the earliest Great Eastern engines to be fitted with the Westinghouse. 308 had the La Chatelier counter-pressure water brake.

Of the passenger engines for local trains, there were, in the middle of the 'seventies, a few Sharp's 5 ft. 6 in. singles at work, and also a miscellaneous assortment of 2-4-0 engines with outside cylinders. They were, however, on their last legs, and did only some odd branch line work. The Sharp's 260.0, 262.0, 267.0 had been on the Woolwich and Tilbury services, and one of the type, 74.0, was at Norwich, where it was at one time painted plum colour.

Mention has already been made of the numerous class of 2-4-0 goods engines designed by Mr. Sinclair. As these engines were gradually rebuilt with new boilers between 1878 and 1883, they were used for branch passenger trains to a much greater extent, and many of them were replaced on the goods service by newer six-coupled engines. They were stationed all over the system. Those at Norwich ran to Ely with the night mail

Digitized by Google

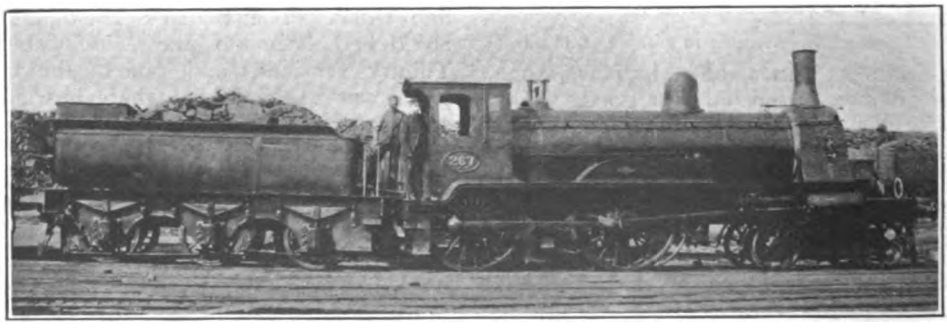
and also on Sundays. 315 and 316 were stationed at Cromer, and one, No. 328, worked from Norwich to Hunstanton and back viâ Dereham and Lynn. The engines of this class in the Ipswich district, of which there were a considerable number, mostly ran to Cambridge, Norwich, and Yarmouth, and a few at Colchester worked stopping trains to London. Several were at Peterborough, mostly on local services, but two of them, 344 and 386, for many years worked the 7.10 a.m. through to London, and returned with the 2.50 p.m. down from Liverpool Street. Several of the class were at Cambridge, and also worked through to London, though most of these engines in this district were stabled at Bury St. Edmunds and Newmarket. The last of them to be scrapped, in December, 1894, No. 0415, was at Cambridge. This engine was one of ten—Nos. 407 to 416—which were built by the French firm of Messrs. Schneider and Cie., of Creusot, in 1866.

These four-coupled engines, like all other goods tender engines on the Great Eastern, had to perform a large share of the goods yard shunting work, for there was no railway in the country which at that time was so badly supplied with shunting tank engines. In fact, with the exception of some half-a-dozen put into service by Mr. Johnson as far back as 1868, there were none,* and it was only in 1886 that Mr. Holden set about remedying the defect by building large numbers of shunting tank engines from that time onward. Shunting work on the Great Eastern had to be performed by any goods tender engines that were run down and almost ready for the shops. In the early "'eighties," having to wait at March Station for a train, I was an interested spectator of the painful and laborious efforts of two of the large-wheeled 2-4-0 Sinclair engines engaged upon the work of marshalling somewhat heavy goods trains in the sidings—work which a six-coupled tank engine could have got through in one-quarter the time.

The best known and most celebrated passenger engines for local trains in use at that time were Mr. Johnson's No. 1 class, of which there were 40. With them might also be classed five domeless 2-4-0 engines, Nos. 125 to 129, with 6-ft. wheels and 16 in. by 20 in. cylinders, designed by Mr. Johnson for the North British Railway, and purchased from Messrs. Neilson and Co. for the Great Eastern. Of these, Nos. 128 and 129 were for a time stationed at Ipswich, and worked the "Ipswich mail" to London, but afterwards all five of the class migrated to Norwich for local train services.

The No. 1 class proper had 5 ft. 7 in. coupled wheels, 16 in. by 22 in. cylinders, and 140 lb. pressure. They were all supplied with four-wheeled tenders of a very neat design, and it may be said that they were the prettiest little engines that ever ran on the line. Moreover, they were as good in performance as they looked in appearance, and did a wonderful amount of hard work for some 40 to 46 years. Of this class 30 were built by Sharp, Stewart and Co., of Manchester,

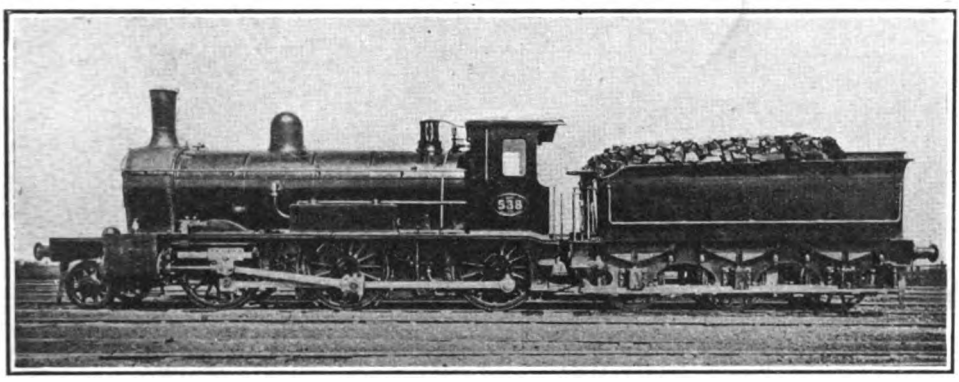
* There were also ten 0-6-0 goods tank engines, 542 to 551, which frequently performed shunting duties. These were built in 1880.



Photo] [*Locomotive Publishing Co., Ltd.*

4-4-0 EXPRESS GOODS ENGINE, NO. 267.
Class 255 to 274, designed by W. Adams, 1876-7, known as the "Ironclads."
Wheels, 6 ft. 1 in.; cylinders, 18 in. by 26 in.

Digitized by Google



"MOGUL" GOODS ENGINE, NO. 538.
One of fifteen (527-541) built in 1879 by Neilson and Co. Designed by W. Adams.
Diameter of coupled wheels, 4 ft. 10 in. Cylinders, 19 in. by 26 in. Flangeless driving wheels.

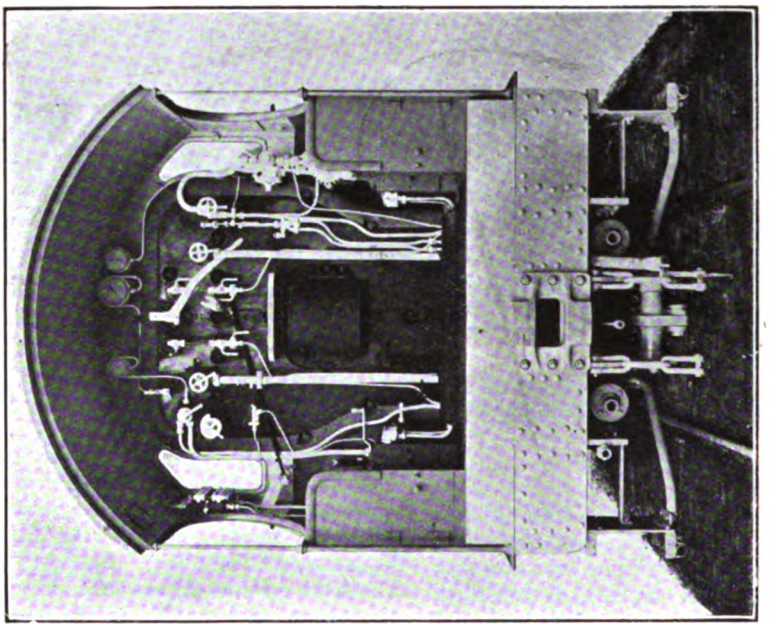
in 1867 to 1871, and the other ten at Stratford in 1869 to 1872.

In their early days they were distributed over the various divisions, including London, but afterwards they were mostly in the Norwich, Lynn, and Cambridge districts. Many of the class passed nearly the whole of their existence in the Lynn district, and worked exclusively on certain Norfolk branches. No. 115, for instance, was stationed at Dereham practically throughout its career, and worked between there and Lynn. In the middle "'eighties" Nos. 28, 29, 43, 103, 105, and 117 were in the Stratford district, and were mostly quartered at Braintree or Maldon. Nos. 5 and 42 were at Ipswich; 6, 26, 31, 33, 34, and 49 in the Norwich district; and Nos. 1, 3, 27, 32, 36, 47, 48, 104, 106, 118, 160, and 161 in the Cambridge division. These latter were mostly at Bury St. Edmunds and other branch stations. Lynn had engines 2, 4, 35, 44, 45, 46, 50, 107, 108, 110, and 112 to 115, which worked nearly all the branches in that district, but occasionally went as far as Cambridge. When these engines were first rebuilt in 1889-90 some were put on the Southend line, which had just been opened. No. 106 was for a time supplied with a hinged chimney to enable it to work the Woolwich and Southminster excursions. Afterwards all went down into the country, and latterly nearly the whole of them were stationed in the Norwich and Lynn districts. The last survivors of the class were quartered at Wells, and worked thence to Norwich, Yarmouth, and Lowestoft. The first engine of the class to be built, No. 1, was the last to be broken up, and ran from October, 1867, to December, 1913, a period of 46¼ years, and several of the others had only a little less service to their credit.

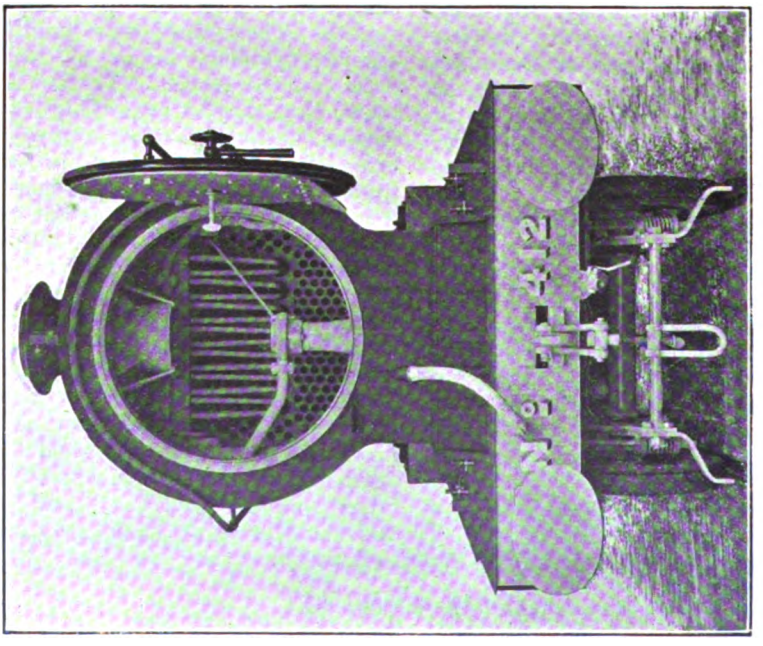
Another class of four-coupled engines which deserve mention were the "Iron-clads," a sort of pseudo-passenger engine. These were 4-4-0 engines, with outside cylinders 18 in. by 26 in., and 6 ft. coupled wheels. There were 20 of them, Nos. 255 to 274, designed by Mr. Adams, and constructed in 1876-7 by the firms of Dubs and Hawthorn. Although primarily designed for passenger work, they gave but little satisfaction, and were very soon relegated to fast goods and fish trains. Several of them ran fast goods trains between Norwich and London, Nos. 255, 256, and 259 working from the Norwich end, whilst 262 for a long time at Lowestoft worked the "mail goods" between there and Ipswich. In their last days (they were all broken up with the original boilers in 1894-1897) they were mostly transferred to the "joint line," and stationed at Doncaster to work fast goods through to London.

(*To be continued.*)

Digitized by Google



FOOTPLATE VIEW.



FRONT END VIEW.

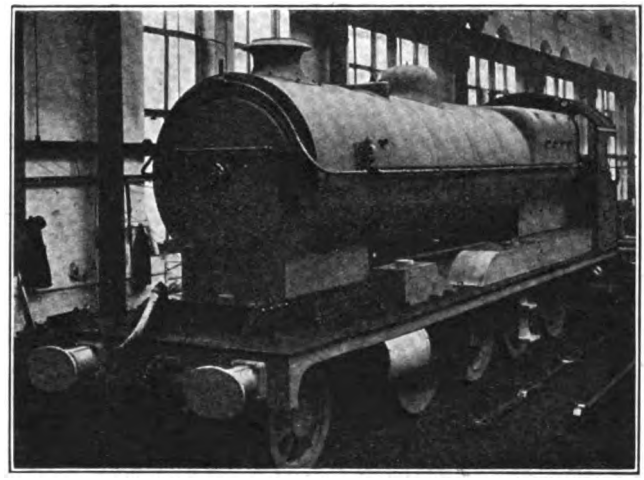
GREAT CENTRAL RAILWAY.

New 2-8-0 type locomotive.

Digitized by Google

The Great Central Railway.

New 2-8-0 Type Locomotive.



ENGINE IN ERECTING SHOP AT GORTON WORKS.

MR. JOHN G. ROBINSON, Chief Mechanical Engineer of the Great Central Railway, to whose courtesy the RAILWAY MAGAZINE is indebted for the photograph reproduced as frontispiece to this month's issue, and likewise for the illustrations in these pages, has under construction at the Gorton works of the Company some new locomotives of the 2-8-0 type, fitted with boilers of increased size, equipped with 28-element superheaters.

These engines are built on the same general plan as those of the 2-8-0 wheel arrangement already in service on the Great Central Railway, but whereas the earlier examples have 5 ft. diameter boilers with 24-element superheaters, the new ones are fitted with 5 ft. 6 in. diameter boilers and the enlarged superheaters referred to above.

Of imposing size, these locomotives, with their increased steam generating capacity will rank among the most powerful engines of their class to be employed in Great Britain. The end views, as depicted on the opposite page, show in the one case the excellent arrangement of the cab, which is characteristic of all Mr. Robinson's engines, and in the other the arrangement of the superheaters and other tubes is clearly seen. The fire tubes are placed at the sides as well as below the superheater flues, and the smokebox arrangement is noteworthy for its accessibility and compactness.

Following are some of the principal particulars :—

Cylinders (2)	21in. dia. × 26in. stroke
Wheels, truck	3ft. 6in.
„ coupled... ...	4ft. 8in.
Rail to centre of boiler	8ft. 11in.
Length over buffers ...	6ft. 8½in.
Boiler, barrel	15ft. × 5ft. 3½in. to 5ft. 6in.
Firebox, outs	8ft. 6in. × 5ft. 8¾in.
„ height inside.	7ft. 1⅛in. and 5ft. 10⅝in.
Tubes—	
Superh'ter elements.	No. 28 × 1⅜in. dia.
Large tubes	„ 28 × 5¼in. dia.
Small tubes	„ 116 × 2¼in. dia.
Heating surface—	
Superh'ter elements.	308 sq. ft.
Fire tubes	1,641 „
Firebox	174 „
Total	2,123 sq. ft.
Fire grate	26 „
Working pressure ...	200 lb. per sq. in.

In working order the engine and tender weigh 123½ tons. The weight available for adhesion is 67 tons 18 cwt. The front truck carries 7 tons 6 cwt. and the tender in working order weighs 48 tons 6 cwt. The engine develops a tractive force of 34,237 lb. at 85 per cent. of the boiler pressure. The superheater is of the Robinson pattern, and an Intersifore lubricator supplies oil to the cylinders and piston valves. The boiler is fitted with top feed arrangement, a device which is now a standard fitting on several classes of Great Central Railway locomotives. An excellent example of British locomotive design is represented by this engine, and the performances of the earlier class have been of a very satisfactory nature; a large number of locomotives having been built to practically the same drawings for services abroad.

Digitized by Google

The Early History of the London, Brighton and South Coast Railway from its Inception to the End of 1847.

By H. H. MEIK.

LIKE many other railways in the United Kingdom, the London, Brighton and South Coast Railway has been built up by the amalgamation of a number of smaller lines, and even at the present time the Company does not own the whole of the *original* main line between London Bridge and Brighton, there being two portions detached from each other which are owned by the South Eastern and Chatham Railway (S.E.R. Section), viz., the part between London Bridge and Corbet's Lane which originally belonged to the London and Greenwich Railway, and the part between Stoats Nest Junction and Redhill (Redstone Hill) Junction, which is afterwards referred to.

A railway between London and Brighton was first projected as early as 1825, but was not seriously considered until 1835, when no less than six different engineers proposed as many different schemes, viz., Robert Stephenson, Sir John Rennie, Gibbs, Cundy, Palmer, and Vignoles.*

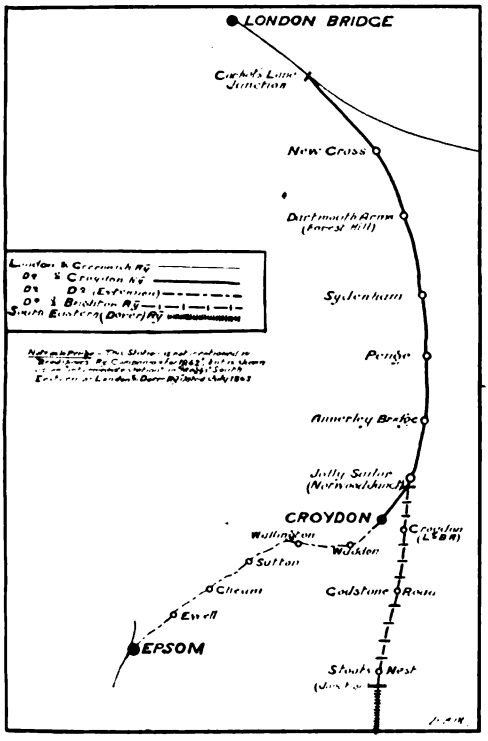
The contending claims of the several projectors were referred to the decision of Captain Alderson, R.E., who was deputed by a Parliamentary Committee to decide which scheme was the best. He reported in June, 1837, that "the direct line (Rennie's) is the best between London and Brighton as being the shortest route and giving the most convenient terminus at Brighton."

GREAT JOINT STATION OF THE CROYDON, BRIGHTON AND DOVER RAILWAY COMPANY, SOUTHWARK (LONDON BRIDGE), IN 1844.
From an old wood-cut.

The costs of the various Parliamentary

* NOTE.—For diagrams of the different routes, readers are referred to the RAILWAY MAGAZINE for May, 1909, Vol. 24, pp. 393-5.

Digitized by Google



contests for the line were as follows: (1) Rennie's Line, £72,000; (2) Stephenson's Line, £53,750; (3) Cundy's Line, £16,500; (4) Gibbs' Line, £26,325; (5) Cubitt's South Eastern (Dover) Line, about £25,000, making a total of £193,575.

At first the London and Brighton Railway Company ran over the London and Croydon Railway until 1846, when the two companies were amalgamated as aforementioned. The section in question was 7 miles 43 chains, and started from Corbet's Lane Junction, after-mentioned, to a point 52 chains south of the "Jolly Sailor" Station, now known as Norwood Junction, and the Croydon Railway being the older section under consideration, it is herewith dealt with first.

The London and Croydon Railway.

This railway was incorporated by an Act dated June 12th, 1835, with a capital of £140,000 and loans to the extent of £45,000. Prior to the amalgamation with the London and Brighton Company, eight other Acts had been obtained, authorising the creation of capital to the extent of £1,000,000 and loans to the extent of £361,333. One of the Acts passed on July 29th, 1844, authorised the Company to extend their line from Croydon to Epsom Town. This Act, although granted ostensibly to a separate company, was really granted to the Croydon Company, as the members of that company were directors and shareholders of the extension company. The Extension Act contained a power of sale to the original Croydon Railway Company which was exercised immediately on the passing of the Act.

One of the conditions on which the Croydon Railway obtained their Act of Incorporation was that they should buy the old Croydon and Rotherhythe Canal, which was opened in 1807-8, and had not proved a success, and in 1835 the greater portion of the canal roadbed was converted into the railway. Between New Cross and Forest Hill (originally called "The Dartmouth Arms") there were some 25 locks, and the difference in the levels between the two places accounted for the heavy bank of 1 in 100 now known as the New Cross Bank, having a length of 2 miles 58 chains.

The original Croydon Station, now known as Croydon West, actually stands on the original site of the old Canal Basin and extended to nearly 5 acres. Portions of the canal and towing-path used to be visible in the neighbourhood of Anerley. The length of the line from Corbet's Lane Junction to the Croydon terminus was 8 miles 50 chains or thereabouts, and the length of the extension line to Epsom Town was 8 miles 4 chains, making in all 16 miles 54 chains.

Notwithstanding the great outcry in Parliament against the railway on account of the New Cross Bank, it was successfully worked for 15 months from the opening of the line; and if it were not for the fact that New Cross Station was located right at the bottom of the bank there would as a rule have been no necessity for a bank engine for trains which stopped at that station. The Company, who had procured running powers over the London and Greenwich Railway from Corbet's Lane to Tooley Street, erected a station of their own, which was situated contiguous to the Greenwich Company's line. The station itself was elevated on arches to the height of the Greenwich line, and

Digitized by Google

was about 100 ft. in width and about an average of 300 ft. in length. The offices were beneath the level of the railway, and were entered from Joiner Street. The passenger shed was 170 ft. long and about 48 ft. wide.

The Greenwich Company exacted from the Croydon Company a toll of 3d. per passenger for the use of their line.

The directors of the Croydon Company having decided that they ought to have a separate and distinct terminus for their line, they accordingly procured an Act in 1836 (6 and 7 Will. IV., Cap. 121) for the construction of a station in the parish of St. Olave and Borough of Southwark (now known as London Bridge), with a yard, warehouses, and other conveniences at an estimated cost of £100,000, the original terminus in Tooley Street (a half-finished structure and never roofed in) being abandoned.

The line was opened from Corbet's Lane to Croydon on June 5th, 1839, and the extension line to Epsom on May 10th, 1847.

There were six intermediate stations, viz., New Cross, Dartmouth Arms (now called Forest Hill), Sydenham, Penge, Anerley Bridge, and "The Jolly Sailor" (now called Norwood Junction).

The intermediate stations between Croydon and Epsom were Waddon, Wallington, Sutton, Cheam, and Ewell.

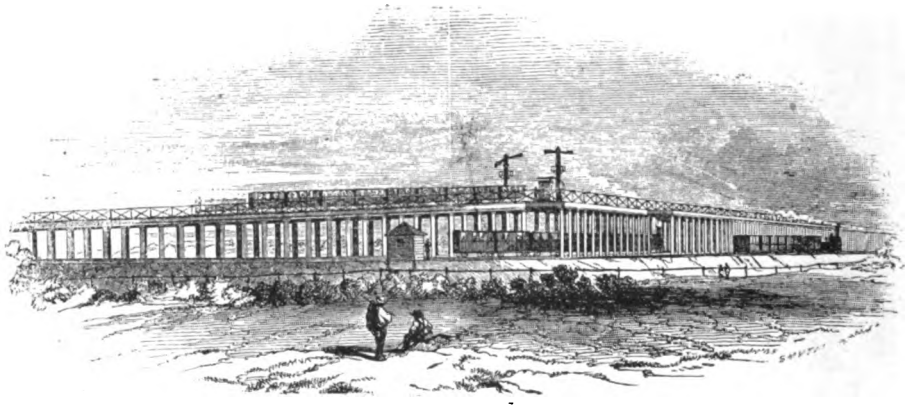
With the exception of the New Cross bank before-mentioned, the ruling gradient was 1 in 660 both ascending and descending.

The chief earthwork on the line was the New Cross cutting, and the amount excavated formed the embankment between New Cross and Corbet's Lane Junction, the remainder being deposited in spoil banks.

The bridges numbered 18 altogether, exclusive of the viaduct at Corbet's Lane Junction, and were chiefly built of brick. There were also six large culverts, the principal ones being at New Cross and Sydenham.

The high roads which were crossed on the level was that from Dulwich to Bromley and those at the Dartmouth Arms and the Jolly Sailor Stations, a policeman being stationed at each place to attend to the gates.

The gauge of the line was 4 ft. 8½ in., the "six-foot way" being 6 ft. 5 in.

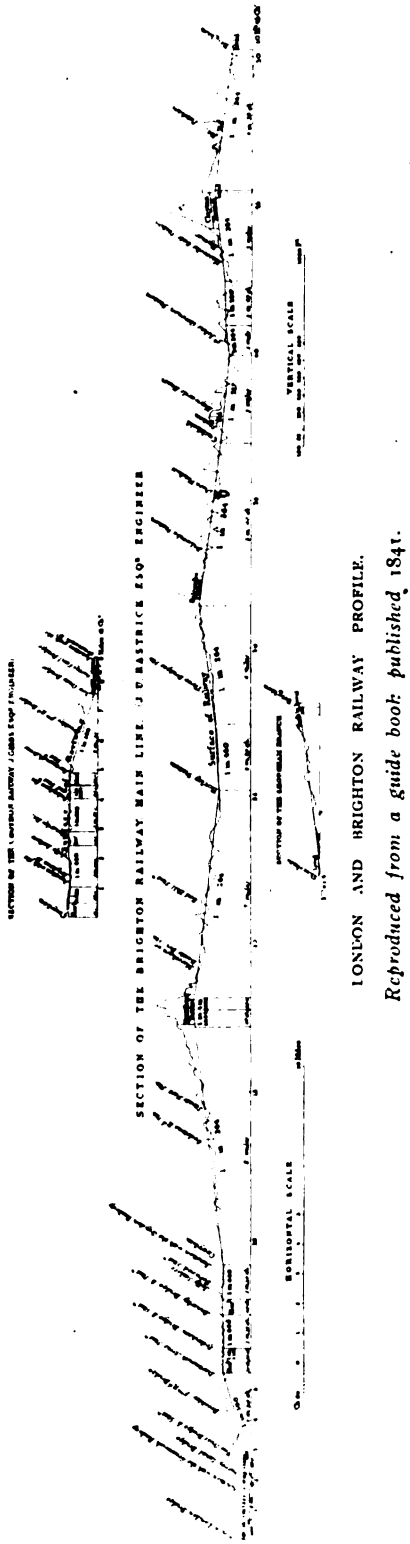


VIADUCT OF THE CROYDON ATMOSPHERIC RAILWAY, CROSSING THE DOVER AND BRIGHTON LINES, BETWEEN NORWOOD AND CROYDON.
From an old wood-cut.

The rails were of the broad-based T form in 15 ft. lengths, laid throughout on longitudinal sleepers with a layer of felt between the wood and the rails, the whole being fixed on cross sleepers, the wood portion being Kyanised.

During the year 1840 two Acts were procured. One was dated August 7th, 1840, and provided for the line being widened between Corbet's Lane and London Bridge in order to allow of four pairs of rails. This widening was necessary owing to the great increase of traffic due to the line being used by each of the South Eastern, Greenwich, Croydon, and Brighton Railway Companies. The other Act was dated August 10, 1840, and provided for additional station room at

Digitized by Google



LONDON AND BRIGHTON RAILWAY PROFILE.

Reproduced from a guide book published 1841.

London Bridge in order to accommodate the four companies above-mentioned. the north-east portion thereof being allocated to the South Eastern and Greenwich Railways and the south-west portion to the Croydon and Brighton Railways.

The station was in the Italian palazzo style, modified in its details and proportions to suit the locality and office uses. The front forms a handsome range of buildings, which, as shown in the accompanying illustration, was about 250 ft. in extent. The area occupied about 3 acres, and the station was opened in February, 1844. In March of the same year a new entrance from St. Thomas' Street was opened.

The station at London Bridge having become overtaxed with the traffic of the four companies using it, the Croydon Company, in conjunction with the South Eastern Company, procured an Act dated July 4th, 1843, for a branch line from the main Croydon line at Cooper's Bridge Junction, 36 chains south of Corbet's Lane Junction, to a terminus situated at Pace's Walk, between the Old Kent Road and Willow Walk, where the Bricklayers' Arms Station was erected, and either under the powers contained in the above Act or under one of equal date therewith, the South Eastern Company subsequently purchased the Croydon Company's share in the branch for £82,877 7s. 1d. The branch was opened for traffic at 7.45 a.m. on Wednesday, May 1, 1844.

The line after leaving the Bricklayers Arms terminus crossed the Grange Road by a flat bridge of three openings and then took a straight course eastwards to Rolls Bridge, a timber-work structure, "built on the American tressle principle." Near by was the Bricklayers Arms Junction, 1 mile 11 chains from the terminus, where the line divided, one line, proceeding under the main Croydon line, joined the South Eastern Railway at Surrey Canal Junction, while the other line, turning south-eastwards, proceeded over a wooden viaduct on a gradual ascent from the Bermondsey level to the New Cross embankment, reaching the main line at Cooper's Bridge Junction, a further distance of 38 chains.

The New Cross Station was on rather an extensive scale, occupying about $2\frac{3}{4}$ acres of ground. The locomotive engine

Digitized by Google

house and carriage repairing shed occupied the central portion of the area.

The average speed of the locomotive trains in 1841 was nearly 21 miles per hour, and the fares were 2½d. per mile first-class and 1¾d. per mile second-class.

The first locomotives of the Company were as follows, viz., *Surrey, Sussex, Kent, London, Victoria, Croydon,* and *Archimedes,* all of which were six-wheeled locomotives, with 5 ft. 6 in. single-driving wheels, and cylinders 13 in. diameter by 18 in. stroke. The first five were built by Sharp, Roberts and Co., and the other two by G. and J. Rennie.

Between the years 1839 and 1843 the following locomotives would appear to have been added :—

Sydenham, of the same dimensions as the above, built by Sharp, Roberts, and Co.

Hercules, with 5 ft. single driving wheels and cylinders 14 in. diameter by 18 in. stroke, by the same makers.

Coryndon, with 5 ft. 6 in. single driving wheels and cylinders 13 in. diameter by 18 in. stroke, built by J. Chanter.

Achilles. with 4 ft. 6 in. driving wheels and cylinders 14 in. diameter by 20 in. stroke, built by Sharp, Roberts, and Co.

There were three others, having 5 ft. 6 in. driving wheels and cylinders 14 in. diameter by 18 in. stroke, which were also built by Sharp, Roberts, and Co. These, however, do not appear to have been named.

The direction of the line and the contour was laid out and executed under the direction of Mr. Gibbs, C.E., with Mr. C. H. Gregory as resident engineer.

Any description of the Croydon Railway would not be complete without a reference to the atmospheric principle which was used on the line.

In 1843, on the recommendation of Sir William Cubitt (the consulting engineer), the Company determined to adopt the atmospheric system, and accordingly obtained powers to lay down an atmospheric line by the side of the existing locomotive tracks to Croydon and also on the Epsom extension. The line was constructed from Croydon to Forest Hill in the autumn of 1845, and afterwards extended to New Cross. It was intended to extend the system to London Bridge and Epsom, but these extensions were never carried out. Continued trouble involved frequent suspension of the traffic, with the result that at a meeting held by the directors in May, 1847, "it was decided to abandon the atmospheric system altogether."

The method used was that invented by Messrs. Clegg and Samuda, and consisted of a large tube laid down in the centre of the track with an opening at the top, which was closed by a valve formed of leather which was covered with short plates of iron above and below. It was pressed against the top of the pipe by a succession of long rods screwed down with hook bolts. On the side on which the valve opened was a groove which was filled with a composition of wax and tallow, and when the valve was raised there was a space for a bent plate of iron to pass into the tube. A piston was attached by a bent plate, and connected with the piston rod were four wheels, two being before and two being behind the bent plate, so that when the piston was in the pipe the wheels raised the valve and prevented it touching the bent plate. The engines which worked the large air pipes were stationed at intervals of 3 miles along the line, by means of which the pipes were exhausted of air. One of these stationary engine-houses still remains, or did so until a comparatively recent date, at Forest Hill.

On the atmospheric system in May, 1846, there were from London on weekdays four morning and 15 afternoon trains, the first of which started at 8.15 a.m. and the last at 10.15 p.m. Three of the afternoon trains (2.45, 3.45, and 4.45) stopped at Forest Hill only, while the 5.45 stopped at Sydenham also. The other trains stopped at all stations.

From Croydon there were seven morning and 13 afternoon trains, the first and last of which started at the same times as the down trains. The 9.50 and 10.50 a.m. and the 6.50 and 7.50 p.m. trains stopped at Forest Hill only, while the 8.50 stopped at Sydenham as well. The other trains stopped at all stations.

On Sundays there were five down and three up trains in the morning and 13 down and 15 up trains in the afternoon. The 9.45 and 10.45 a.m. and the 1.45, 2.45, and 3.45 p.m. down trains, and the 5.50, 6.50, 7.50, 8.50, and 9.50 p.m. up trains stopped at Anerley, Forest Hill,

Digitized by Google

and New Cross only. The remaining trains stopped at all stations.

The London and Brighton Railway.

The result of Captain Alderson's report (referred to on page 92 hereof) was that a Bill for "Rennie's" line was presented to Parliament, and which in the course of time duly reached the House of Lords in 1837, where it was at first rejected, the Lords having adduced as a reason that the South Eastern Railway had already obtained an Act (dated June 21st, 1836) for a line to Dover via Red Hill Junction, formerly called Reigate or Redstone Hill. The reason given for the rejection being "that the South-Eastern Railway already went 20 miles of the way to Brighton, and had been obliged to use the route in question," and when the Bill was before the House of Commons in 1836 the Speaker stated "that no second outlet for a railway would be allowed to the south." The result of all this Parliamentary litigation was that the London and Brighton Company was forced to make a line from near Norwood, as before stated, to Brighton, and to sell, transfer, and relinquish *one-half* of the line "as shall be at or to the northward of the point at which the junction of the said South Eastern Railway with the said London and Brighton Railway shall be so authorised . . . so that they may henceforth form a part of the South Eastern and not of the London and Brighton Railway." The consideration for the transfer and sale under the Act of July, 1842 (2 and 3 Vict., Cap. 79), was the repayment by the South Eastern Company to the London and Brighton Company of all money, costs, and expenses connected with the works, making together with interest at the rate of 5 per cent. a total of £340,000, and "each company having the privilege of passing over tht whole distance between the junction with the Croydon Company and Redstone Hill Junction without either paying toll to the other." This jointly-worked line is at present 11 miles 54 chains in length.

Under the Company's Act of Incorporation, dated July 15th, 1837, they were authorised to raise a capital of £1,800,000 and loans to the amount of £600,000.

By Act dated July 27th, 1846 (9 and 10 Vict., Cap. 283), the London and Croydon and the London and Brighton Railways were amalgamated, with a share capital of £4,067,214, debentures to the extent of £811,498 and loan notes for £33,060, under the title of

The London, Brighton and South Coast Railway.

Prior to this amalgamation the London and Brighton Company had to pay to each of the London and Greenwich and London and Croydon Companies a toll of 3d. per head for each passenger carried over their lines. In 1849 an arrangement was come to between the Brighton and South Eastern Companies, whereby the former Company procured the right of free user over the London and Greenwich line into London Bridge.

On the jointly-used line between Norwood Junction and Red Hill Junction the Brighton Company's trains stopped at the stations north of Stoats Nest Junction (the boundary point) and the South Eastern Company's trains stopped at stations south of that junction. Purley, although on the Brighton system, was used by both companies by agreement.

The line, as before stated, along with the Shoreham branch, was originally laid out by Sir John Rennie, but shortly after the Act of Incorporation was procured John Urpeth Rastrick, Esq., C.E., was appointed to superintend the construction of the line, and he made a more detailed survey of the route, with the result that the general contour of the line was greatly changed and improved. This detailed survey caused some delay, and it was not till July 12th, 1838, that the first sod was cut at the deepest part of the cutting on the north side of Merstham Tunnel.

The line was opened from Brighton to Shoreham on May 12th, 1840; from the junction with the Croydon Railway to Hayward's Heath on July 12th, 1841, and to Brighton on September 21st, 1841.

When the line was opened to Hayward's Heath it was stated in a leading journal that "about midday a train left London Bridge filled with directors, shareholders, and officials of the company, and proceeded at an astonishing rate of 12 miles an hour to Norwood, where the two engines were replenished with water and fuel, and after passing through Red Hill, Three Bridges, and Balcombe, Hayward's Heath was reached in perfect safety."

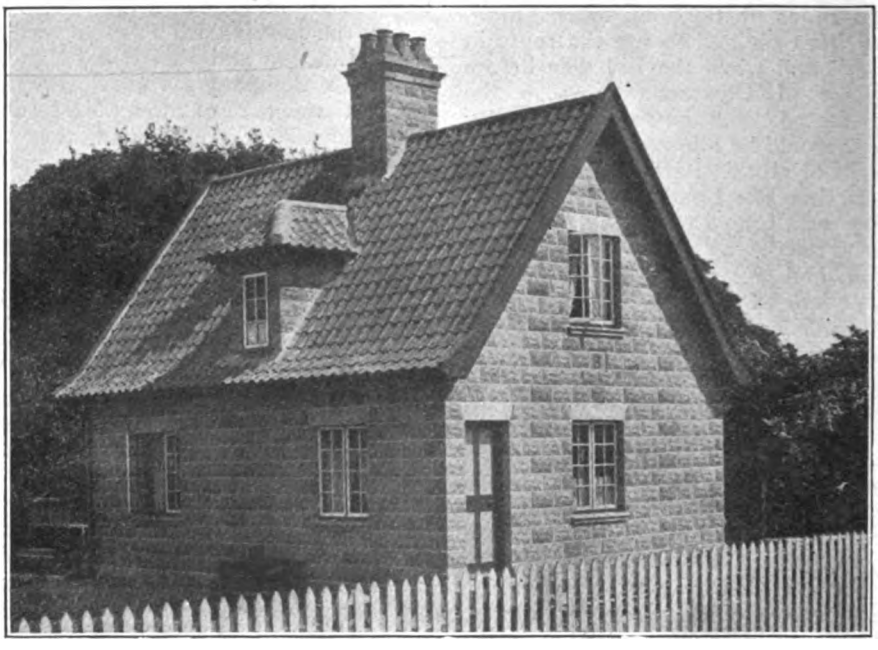
(To be continued.)

Digitized by Google

Railway Uses for Reinforced Concrete.

AS most RAILWAY MAGAZINE readers are aware, the use of concrete and reinforced concrete on railways is not a novelty, as for years past the value and usefulness of these materials have been developing, although at a slower rate, perhaps, than circumstances have warranted. The present writer proposes to devote attention more particularly to the possibilities of reinforced concrete in what may be termed the lighter forms of work on railways, such as signal-boxes and posts, station platforms and buildings, telegraph posts, sleepers, and so forth, as apart from such heavy works as retaining walls of large area, bridge construction of the more massive kinds, and extensive permanent structures of other descriptions. It is well understood that concrete and reinforced concrete are applicable in an almost unlimited sense to heavy works of these descriptions, but the use of the latter class of material has not, until more recently, been seriously considered for other permanent objects, such as those referred to above, as an efficient, practical and durable substitute for brick, wood and steel.

The war has evolved conditions that make it more than ever necessary to supplant these materials by something which, possessing equal if not superior qualities in respect of strength and permanency, is easier to acquire in sufficient quantities, and upon which reliance can be placed that all requirements will be met. The prevailing hostilities may, therefore, be said to have given an impetus to the development of the use of reinforced concrete on railways; and much of the prejudice formerly existing against it, which to no small extent was based upon lack of appreciation of its merits, has now been, or is in process of being, broken down. Opposition to the use of reinforced concrete largely came from transporters and erecters, who, not unnaturally, took the view that articles made of it are heavier to handle than

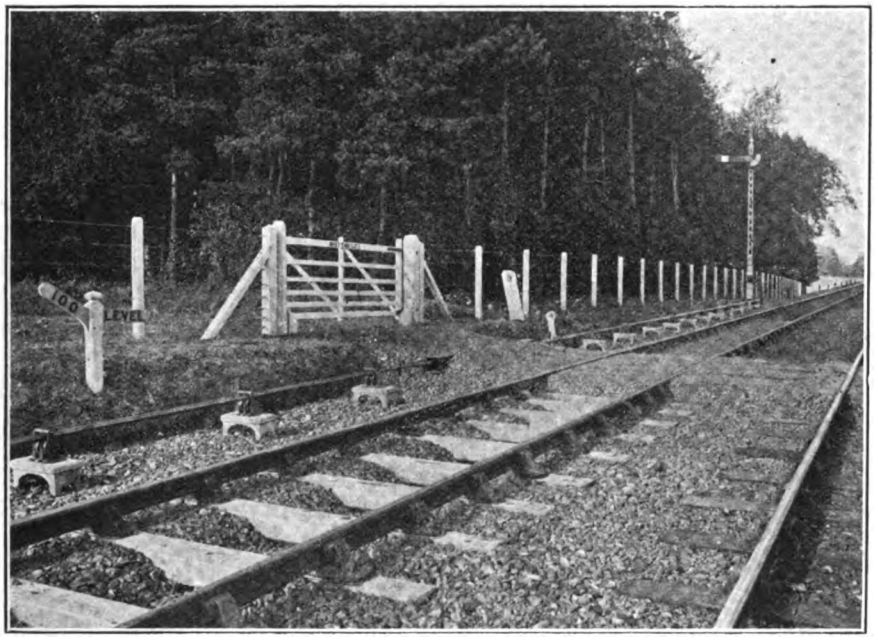


RAILWAY GATE HOUSE IN CONCRETE WITH FERRO-CONCRETE FITTINGS.

Digitized by Google

wood, and, at the same time, the care required in dealing with such articles during transit and erection is much greater than would otherwise be the case. The greatest strains which concrete of all descriptions have to withstand are usually those imposed during the periods of transport and erection, for once it is fixed in its final position it may be properly regarded as a structure which will, as events have proved, withstand numberless years of service.

This subject in all its bearings was recently discussed with Mr. William Marriott, M.Inst.C.E., Resident Engineer and Locomotive Superintendent of the Midland and Great Northern Joint Railway, by whose courtesy ample facilities have been afforded for inquiry and inspection of what has already been done on the railway he serves in the way of applying reinforced concrete in the construction of a variety of articles required by the Way and Works, Signal, and other Departments. Mr. Marriott is the originator of a number of patented inventions and registered designs for signal and telegraph posts, sleepers, girders, and other articles, and many constructed on his system of reinforcement in concrete have already been established on a number of other railways, and, in addition, are constantly being increased. The present prevailing scarcity of timber and steel is too well known to need emphasising here, and it has indeed become an almost imperative measure in many cases to resort to reinforced concrete in the renewal of railway permanent structures ranking among the categories mentioned. It is not intended by this to imply that the use of reinforced concrete on railways in the directions indicated is to be regarded as a temporary or emergency measure, for after inspection of what is being done at the present period on the Midland and Great Northern Joint Railway and other railways, the conclusion arrived at, is that in normal as well as in times like the present, the employment of the material offers many substantial advantages.



THIS PICTURE INCLUDES TEN ARTICLES IN FERRO-CONCRETE, INCLUDING SIGNAL, MILE, AND GRADIENT POSTS, FENCING, SLEEPERS, ETC.

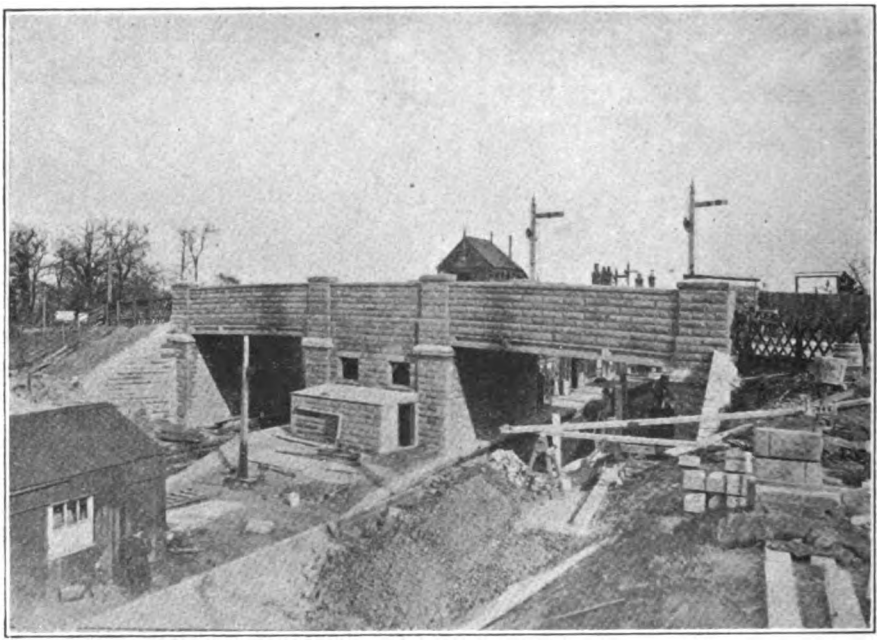
First cost and maintenance enters very largely into questions of this sort, but in estimating the figures regard must be paid to ultimate as well as initial economy, and if this is done with the care required, it will be found that a remarkably good

Digitized by Google

case can be made for concrete. At the moment the matter cannot be presented on the basis of definite figures, but practice has already proved that the manufacture and erection of the reinforced concrete articles have not only brought about an enormous saving of timber, but have very considerably reduced maintenance cost. Altogether 135 different articles are regularly made of reinforced concrete on the Marriott system, and the successful production of these is the outcome of many years of patient study and labour. Concrete work is not so simple as some people imagine, as to produce good work requires a vast amount of skill in designing and manufacture. There are many novel points in the making which can only be developed by careful study of the minutest details of the actual work, but judging from the appearance of the various objects, examined on the Midland and Great Northern Joint Railway, and going also by the records as to their durability and service, no doubt can remain that Mr. Marriott has overcome all the difficulties in an entirely satisfactory manner.

Most careful tests have been made at Melton Constable and at the works of John Ellis and Sons, Ltd., Leicester. At both places the articles are manufactured, and the tests prove that reinforced concrete, when scientifically designed, will withstand great tensile strain, and also give ample warning before complete failure occurs. Even after the concrete has failed by serious cracks, the reinforcement still retains its elasticity, so much so that if the load be removed, the post will spring back, practically speaking, to its proper alignment.

An all-important point in the construction of ferro-concrete is that of the manner in which the steel reinforcement is applied. The ability to withstand tensile stress permanently and the strains imposed during erection, depend almost entirely upon the method of applying the steel, and it is in the special triangular building up and welding of the steel reinforcement, a matter which forms the basis of the Marriott system, that impart to the articles made in accordance therewith, the very high degree of durability and stress resistance which they have been proved to possess. The most painstaking study and calculation have been devoted to this essential feature of the construction; disappointments have arisen and

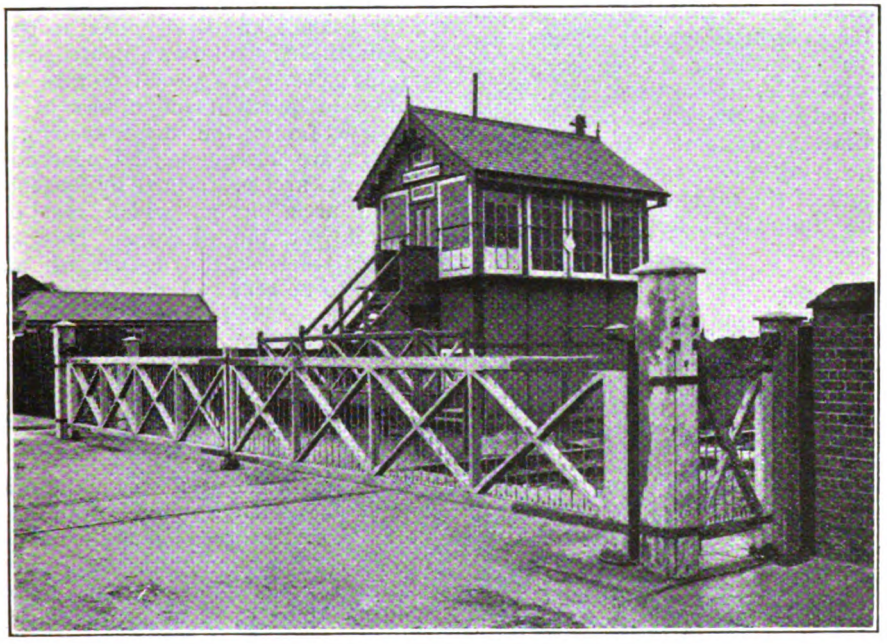


RECONSTRUCTION OF BRIDGE AT MELTON CONSTABLE.

Digitized by Google

many difficulties have had to be overcome, but the final product would appear to have justified the many years of labour devoted to the subject, and there now appears to be practically no limit to the number of cases to which the material can be applied.

In the Marriott system the reinforcement is designed and accurately calculated, so that the whole of the metal is distributed round the extreme fibres where the stresses are greatest; this enables articles of reasonable dimensions to be cored to the fullest extent, greatly reducing weight without appreciably



GATE POSTS FOR MECHANICALLY OPERATED GATES.

reducing the strength. When transport or erection are in view this is a most important factor, and one which immediately removes what has been a signal drawback in the employment of concrete.

A simple test, on the average of three ordinary fence posts $4\frac{1}{2}$ in. by $3\frac{3}{4}$ in., made in the ordinary way with $\frac{1}{4}$ in. main rods and usual binders compared with three reinforced on the Marriott system, showed the ultimate load carried to be 28 per cent. higher, while the general deflection was 20 per cent. less, the maximum deflection, previous to collapse, 130 per cent. more. These ordinary fence posts (not designed as beams or girders) were tested by being placed on supports 5 ft. apart, a gradually increasing load being applied in the centre.

Other tests include those applied to reinforced concrete signal posts and telegraph poles, the latter of triangular section, both constructed on the Marriott system of welded reinforcement. A light type of signal post was taken, slightly damaged by cracks for a distance of 6 ft. up from the base. It was tested as a cantilever in its stiffest direction, 5 ft. being firmly fixed, the pull applied at a leverage of 18 ft. 6 in. The size of the post at ground line was 11 in. by $7\frac{1}{4}$ in., main rods $\frac{5}{8}$ in. diam., centres 1 in. from outside of concrete post. It was made on June 9th, 1916, and tested May 15th, 1917, after a period of 11 months and 1 week.

The load was applied $\frac{1}{2}$ cwt. at a time. Very fine cracks appeared near the point of fixing under a load of $6\frac{1}{2}$ cwt., deflection = $1\frac{1}{16}$ in. with 12 cwt. on, deflection = $10\frac{7}{16}$ in., these cracks becoming serious at the point of fixing. With $13\frac{1}{2}$ cwt., deflection = $23\frac{1}{2}$ in., the tension rods were exposed and the test was, therefore, carried no further. The whole

Digitized by Google

of the load was then taken off and the post sprang back 4½ in., and the tension rods were found to have 1¼ in. cover. By calculation the safe load should be 3½ cwt. and the breaking load 14 cwt., *i.e.*, the tension rods should have passed their limit of elasticity with 14 cwt. on, but evidently the point of elasticity was not nearly reached with 13½ cwt. The first hair cracks were noticed at 6½ cwt. load. This gives a factor of safety of 1.86 over the safe calculated load. If the tension rods had only had ¾ in. cover as designed and used in the calculations, the factor of safety would have been still greater. The post measured 27 ft. long overall.

A reinforced concrete telegraph pole 24 ft. long, light triangular section, was tested as a cantilever for tension on the double rod side, a length of 4 ft. being firmly fixed and the load applied ½ cwt. at a time, at a point 1 ft. 6 in. from the top, giving a leverage of 18 ft. 6 in.

The age of the post was seven months, and the following figures show the results :—

Load. Cwt.	Deflection. Inches.	Remarks.
5	3 1/16	Hair cracks produced.
7½	6 1/16	Load taken off permanent set 3 in.
10	9 3/8	Numerous cracks.
11½	19 11/16	Tension cracks serious. Concrete in compression crushed and fell away exposing main rod. Load taken off permanent set 11 1/16.

Safe calculated load ... ... 280 lb.
Actual load producing first crack ... ... 560 lb.
Therefore factor of safety over safe load. 2.0
These posts can be made to any required strength.

Early in 1917 the signal engineer of one of the principal English railways visited Ellis and Sons' works at Leicester, and asked for a post to test. One 32 ft. 6 in. long was chosen, blocks and falls were fastened 4 ft. from the top of the post and a rope attached to rails of siding. The top of post was then lifted on props 10 ft., when the blocks came into action the post being then raised to the vertical in the foundation hole, and steadied by three guys held by a corresponding number of men. No timber protections or reinforcement to the post was used; the ladder was fixed and a man stood on top of the post within 30 minutes. This obviously is not a fair or even the best way of dealing with a post, but it was adopted solely as a test of stability.

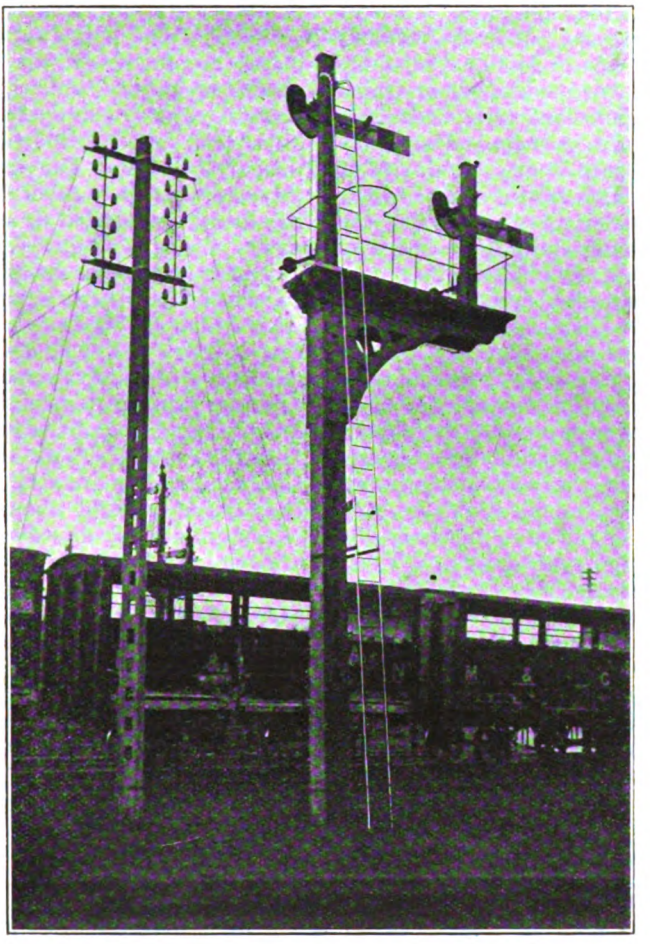
A notable example of concrete work is that of the reconstructed overbridge at Melton Constable Station. Concrete building blocks have, of course, been largely used for structures of this kind. They are far more durable than the average red brick, and less costly than blue brick, being of larger dimensions. The walls are constructed more rapidly, since there are fewer joints, therefore requiring less mortar, whilst the appearance is very much better. The blocks may be either rough-faced, chisel-faced, pecked or plain, and they may be made at the central depôt and transported to the site, or, in the case of large contracts, made on the spot. A special feature of the bridge in question and others of similar construction is the floor system. The girders are surrounded by concrete, and the jack arches formed by special reinforced arch blocks, which rest on the concrete of the girders. This system enables the superstructure of an old bridge to be removed and the new superstructure erected in a few hours, no centreing of any description being necessary. This is important on busy lines, and particularly so on a single line of railway; and it proved highly efficacious in the instance cited.

At some of the stations on the Midland and Great Northern Joint Railway concrete and reinforced concrete have been used in connection with the renewal of platform walls and station buildings, whilst cottages and other buildings have been erected at different points on the railway property. These buildings are made in concrete throughout, except the doors, floor boards and a few small items. The floor beams are of reinforced concrete with slabs of coke breeze, to which the floor boards and ceiling can be nailed. Reinforced concrete window-frames and sills, made all in one piece, form part of the construction, whilst other articles of concrete in the construction are rafters, window heads and sills, window boards, mantelpieces and lintels. The appearance of the above work is superior to concrete *in situ* from shuttering, and, in addition, it must be remembered that shuttering calls for a large amount of timber, which, once used, is for all other

Digitized by Google

intents and purposes spoilt and therefore very costly.

Signal and telegraph posts as manufactured on the Marriott system of reinforced concrete with welded reinforcement have been subjected to comparative tests, the results of which have shown them capable of carrying loads 20 per cent. greater than with the ordinary system of loosely tied reinforcements. It is claimed that with this system it is possible to keep the weight of all posts, poles, sleepers, girders, etc., as low as possible by coring, and leaving the centre of them hollow, without in any way jeopardising their strength. With this system of reinforcement it is possible to design most posts, standards, girders, beams, and sleepers that they shall only be a little more than double the weight of the wood they replace, and yet still be sufficiently strong. As an example, a large signal post having an average section of 13½ in. by 13½ in. weighs only 97 lb. per ft. run as compared with 172 lb. per ft. run for a solid post. At the present cost of pitch pine a good timber post can be replaced by a concrete one, and the value of the timber recovered more than covers the cost of the concrete post. The latter requires no painting, and this is an item which considerably reduces maintenance cost. An all-concrete bracket signal post has been successfully manufactured and erected, the construction being by no means confined to single or



REINFORCED CONCRETE SIGNAL POST AND TRIANGULAR TELEGRAPH POLE.

Digitized by Google

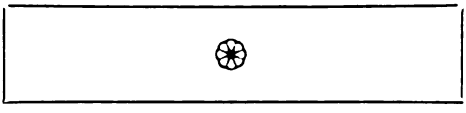
double arm posts alone. In some cases, telegraph posts are of triangular cross-section, which gives them an excellent appearance and somewhat reduces the total weight of the post. Posts, poles, cable masts or electric light standards are designed and manufactured to carry any desired wire pull or load.

The first of the reinforced concrete sleepers constructed on the Marriott system were made and put in the running line immediately east of Melton Constable Station in June, 1916, since when trains and shunting operations have been continuously running over them. They have proved entirely satisfactory, and it is impossible to tell, whilst riding in the trains when one is passing over the sleepers, there being nothing in the way of additional noise to indicate that concrete instead of wooden sleepers are used. Many more have since been put in, and are so far quite sound. The chief feature is lightness compared with the usual solid sleeper. The novel, but simple, manner of securing the chairs allows for adjustment of gauge and elimination of any different sound to the ordinary wooden sleeper. Another application is that of some large railway mechanically operated crossing gate posts. These successfully withstood the shock imposed by the gates being smashed into by a train.

Reinforced concrete fencing posts are used in large quantities on the Midland and Great Northern Joint Railway, the first of these being erected as long ago as 1909. It is stated that the number of breakages is infinitesimal. In all, 35 miles of wire fencing supported by these posts has been erected, the posts being spaced 8 ft. apart as compared with 6 ft. for wooden posts, thus saving 220 posts per mile.

The use of reinforced concrete has also been successfully applied to the production of station name-plates. They are most effective and pleasing in appearance, being manufactured in three-colour shades of concrete. The posts and frames of the plates are made of the usual Portland cement concrete, the background being of special white concrete, whilst the letters, as a rule, are in black, all being permanent colours. The method of manufacture, which has several novel features, has also been applied to mile and gradient posts, along the railway. Other articles comprise concrete ashpit sleepers, the special feature here being the simplicity with which the bolts securing the chairs can be removed, whilst their appearance marks a great improvement over the old running timbers. Reinforced concrete cesspits were one of the first things made, and are established throughout this line. Large quantities are still being made, and these have brought about a considerable saving in labour on railways. The pits are made in five pieces at the depôt, and sent out to the platelayers, who fix them themselves, whereas previously bricklayers had to be employed and all the necessary materials sent forward to the site.

In London the Marriott reinforced concrete system has for its representative Mr. W. Jones, of 154, Upper Thames Street, E.C.



Digitized by Google

Government Control of Railways in War Time.

II.—ENGLAND AND FRANCE.

By VERNON SOMMERFIELD.

WE have seen in the previous article how the United States Railroads, hitherto privately-owned and managed corporations without exception, have as a war measure passed under a system of Government control which not only involves a most unusual degree of centralisation, but robs the individual companies of initiative even where domestic details, such as the purchase of stores, are concerned. The transition from company to State administration is not, however, so abrupt as may appear at first sight. For years past, State Railroad Commissions and State Legislatures have exercised a great and growing influence on railroad activities in the matter of rates, fares, the provision of safety appliances, hours of labour, etc., while there is nothing comparable in the United Kingdom with the very wide powers exercised by the Interstate Commerce Commission. It is desirable to bear these facts in mind, because the extent to which the American railroads are in normal times controlled by the State is, as a rule, not appreciated on this side of the Atlantic.

The salient point of difference between the war-time control of the British and the American railways is that our system leaves the individual companies with a free hand in all matters of detail. The Regulation of the Forces Act, 1871, under which the Government assumed control of the railways on the outbreak of war, nominally provides for the vesting of all or any portion of the railway network in the Secretary of State for War. Actually, the control is vested in an Executive Committee, composed, save for the President of the Board of Trade, who is *ex-officio* Chairman, exclusively of the leading railway managers. These latter retain their managerial functions, as compared with the practice adopted in the United States, where, if a railway manager or other officer should be appointed to a position under the Director-General of Railroads, he must sever all connection with his own company or companies whilst so employed. In other words, the American system takes a practical railwayman and converts him into a Government official, in addition to divorcing him temporarily from the practical experience gained in supervising the operation or administration of a railway with whose problems and capacities he is acquainted; our system leaves him a practical railwayman, and also leaves him in control of his own railway. Without running the risk of being accused of insular prejudice, one may surely claim that the British method is more likely to make for the maximum of efficiency in operation and management.

It is worth while insisting on this freedom of our railways from interference in matters of detail. The companies may be ordered, for instance, to curtail their passenger services by a given percentage in order to economise in coal or to release more men or rolling stock for military purposes, but the re-casting of the time-tables is their own individual affair. State control has simply entailed the obligation to observe certain very broad and very general instructions, such as the order to raise ordinary fares by 50 per cent., but this has merely been done by taking advantage of emergency legislation to give effect to changes which would otherwise have required a special Act of Parliament. Strictly speaking, there is no difference, so far as the administration of the railways is concerned, between an order for increasing fares made under the Defence of the Realm Act and an Act of Parliament passed in normal times to empower the

Digitized by Google

railways to increase their goods rates or to compel them to provide certain safety appliances. The principle of allowing the railways to conduct their own business in their own way, subject only to certain general restrictions, has not been interfered with to any extent. It is for this reason that the British system of war-time control of the railways is unique; in no other country are the railways given so free a hand to carry out their essential and vitally important task of handling the traffic with the maximum of speed and efficiency. Incidentally, our system has made for economy and simplicity in accounting. Under the terms of the financial arrangement entered into between the Government and the railway companies, it is unnecessary to render to a Government Department an account for every consignment of merchandise or minerals carried on military or naval account, or for every soldier or sailor conveyed free or at reduced rates. It is unnecessary because the financial arrangement adopted automatically secures the companies a certain return, and automatically credits surplus earnings to the Government.

Not so in France, where an account has to be made out for each soldier and each ton of goods conveyed on public account. The French railways, it should be explained, while privately-owned, with the exception of the State system, enjoy a different status to that of our own. While the British railways have been constructed under perpetual charters, subject only to the possibility that the State may some day desire to acquire and work them, the French railways are operated under terminable "concessions," usually for a period of 99 years, on the expiry of which they revert to the State, subject to the payment to the shareholders of certain sums in respect of rolling stock, etc. It is to the interest of the State that the companies shall be prosperous in order that their properties may be in good condition at the termination of the company-ownership, and the shareholders are guaranteed a very substantial minimum dividend. In practice this means that should a company's net earnings be insufficient to pay the minimum dividend, the State makes up the difference between the amount actually earned and the amount guaranteed.

To some extent the French arrangement may be regarded as a virtual partnership between the railway companies and the Government. But the Government is not content to be a sleeping partner. It is constantly interfering, through the Ministry of Public Works, in the most trivial matters which would in England be settled at once in the railway company's own offices. For instance, even in normal times, a company cannot alter the timings of a train, take off a train or put on a new one, lower a freight rate or quote a special rate to a trader, without first receiving the sanction of the Ministry of Public Works. That Department takes no action until it has first elicited the opinions of every conceivable and inconceivable interest concerned, a process which does not exactly make for celerity, even if one leave out of consideration the natural and notorious slowness and red tape of all Government Departments in all countries. As a result, it is no exaggeration to say that a simple matter which an English divisional goods manager would settle in a day may take six months or more to bring to completion in France. So that in peace-time, State interference in matters of detail is incomparably greater than it is in time of war in the United Kingdom, or even in the United States.

There is one very important and essential feature in which the war-time organisation of the French railways differs from that of the American and British systems; France is an invaded country, and apart from the territory actually occupied by the enemy, there is a military zone in which the movements of civilian traffic are restricted. These conditions exercise a material influence on the administration and working of the railways. The war-time organisation, as prepared in time of peace, is as follows.

The charters under which the companies work their lines provide that if at any time the Government require to transport soldiers, sailors, or military or naval stores, materials, etc., to any point served by railway, the company or companies concerned are obliged immediately to place all their means of transport at the disposition of the State. A permanent military organisation has been in existence for years with the object of making all the necessary arrangements

Digitized by Google

for the utilisation of the railways in war time.

To each of the principal railway systems — State, Northern, Eastern, P.L.M., Orléans, and Midi—there is attached a special Committee, known as the *Commission de réseau*. This comprises a Technical Commissioner in the person of the General Manager concerned, and a Military Commissioner, who is a high officer of the General Staff, nominated by the Minister of War. The Committee's jurisdiction also extends to the secondary railways, *i.e.*, local, narrow gauge, and light railways, within the territory served by the trunk line. Its duties consist in studying every detail concerning the strategical utilisation of the lines, having regard both to existing tracks, stations, yards, etc., and to any special works, such as military loading and unloading platforms, which may be required by the War Department.

In addition, a "Superior Military Commission for Railways" was set up in 1898. This body is presided over by the Chief of the General Staff, and includes six soldiers of the minimum rank of General, three delegates appointed by the Minister of Public Works, and the above-mentioned Technical and Military Commissioners of the individual railways. The rôle of the Superior Commission is consultative and advisory; it reports on the measures proposed by the Technical and Military Commissioners, as well as on matters relative to the strategical employment of the railways.

On the outbreak of war, certain classes of railway employés are under the same obligations in regard to military service as the average French citizen. These classes include all railwaymen who notify their desire to join the Colours, those liable to naval service, and reservists in the Railway Engineer Corps. Otherwise, the railway staff "carries on" and operates the transport service; those whose age renders them liable to military service being mobilised as railwaymen, but remaining in the employ of the system on which they have been working in peace time. These mobilised men are sub-divided according to their grades and duties, such as Traffic Department, Mechanical Engineer's Department, Way and Works, etc. Each section forms a distinct corps, under the control of the departmental heads and the military authorities, and the men wear military uniform. Under the peace-time organisation, they can be called up for purposes of training, drill, etc., and it was under these powers that the railwaymen were called up during the great strike, which put an end to that disturbance.

In war time, the fundamental principle, embodied in legislation, is that the railway service is entirely under the military authorities.

On the first day of mobilisation, on the notification of the Minister of War, each railway must place at the disposition of the military authorities either its entire system or any designated sections of line. The whole railway network is then divided into two zones under different authorities, the Interior Zone and the Zone of the Armies.

The Interior Zone is under the Minister of War, acting mainly through the General Staff. On the Minister's authority, the *Commission de réseau*, described above, takes all the necessary measures, the two Commissioners for each railway continuing to exercise their respective military and technical functions, the Technical Commissioner being responsible for the actual operation. The Commissioners are assisted by Sub-Committees and Station Committees, each also composed of a military and a technical member.

In the Zone of the Armies, the railways are under the authority of the Commander-in-Chief of the Field Forces, acting through the Director of Army Railways. This zone is sub-divided in its turn. Outside the Zone of Operations, traffic is handled under similar conditions to those prevailing in the Interior Zone. Up to the limit of the Zone of Operations, the service is carried on by the railway employés brigaded on territorial lines, and wearing brassards and distinctive stripes. Within the Zone of Operations itself, traffic is handled by railway troops, including railway sappers.

So far as ordinary commercial traffic is concerned, there is a line of demarcation between the Interior Zone and the Zone of the Armies. Within the latter, ordinary traffic is entirely suspended, save for such exceptions as are authorised by the Commander-in-Chief; in the Zone of the Interior, the extent to which such

Digitized by Google

traffic is carried on depends on the conditions laid down by the Minister of War, who is empowered to authorise the partial or complete resumption of both passenger and goods traffic, when this is proposed by the *Commissions de réseaux*, on completion of mobilisation and concentration. So long as the war lasts, the railways are, of course, under the obligation of assuming, in the first place, and before everything else, the handling of all military and naval traffic, including the requirements on mobilisation and concentration, the carriage of all troops required for field operations, and all transport in connection with evacuation and with the feeding of the armies and the civilian population.

Such, very briefly, is the French war-time organisation, of which two features call for special notice. One is the collaboration of technical, *i.e.*, practical, with military administration, a system whose advantages are too obvious to require comment. It may, however, be pointed out that this collaboration has in practice worked out extremely well, the Military Commissioners have given their technical colleagues a free hand in connection with traffic matters.

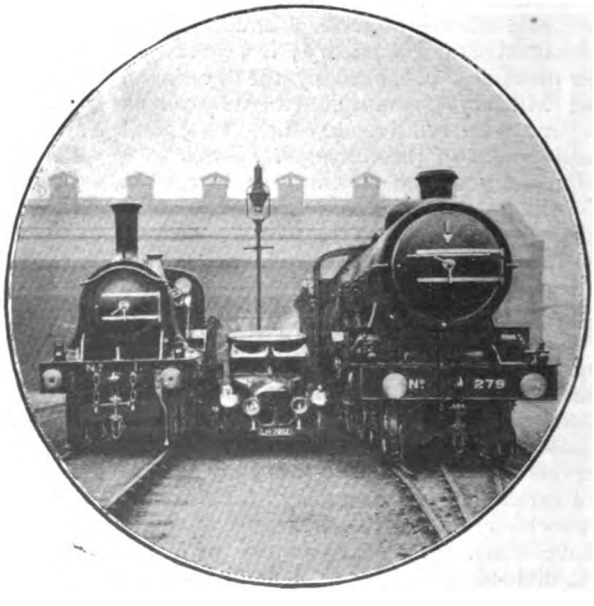
The second point is that this organisation was not left to chance on the spur of the necessity of the moment. It had all been worked out and adjusted in time of peace, so as to be capable of immediate adoption on the declaration of hostilities.

As will have been gathered from preceding remarks, the financial arrangements between the Government and the companies are not so simple as those adopted in the United Kingdom. They necessitate a very considerable amount of clerical and accountancy work, and are further complicated by the question of post-war compensation for damage resulting from the war.

For obvious reasons no mention is made in this article of the administration and operation of the British and American military railways in France.

Locomotives and Motor Cars.

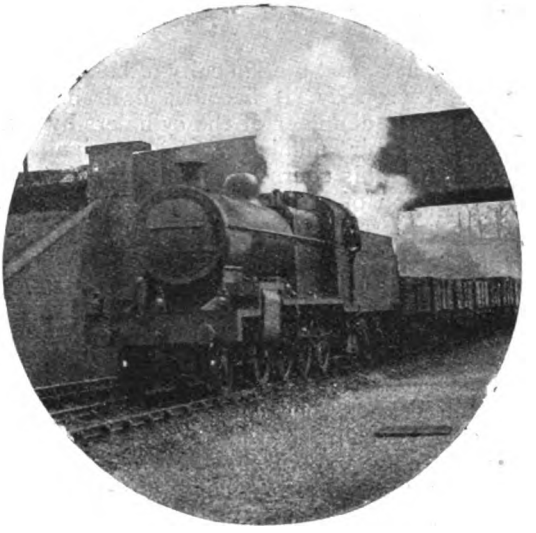
HERE is reproduced a photograph showing one of the latest six-cylinder Napier cars (Alpine-tested) standing between two Great Northern Railway locomotives. The one on the left is the last engine in existence of the celebrated 8 ft. single-wheel type built by the late Mr. P. Stirling at Doncaster. It dates from 1870, and was named "The Greyhound of the North." It has run no less than 3,000,000 miles, and has been on view at various exhibitions all over the world. The engine on the right hand is one of the well-known Atlantic type, which was designed by Mr. H. A. Ivatt, and constructed as a 2-cylinder simple engine in 1904. In 1915 it was rebuilt by Mr. Gresley as a 4-cylinder simple superheater, and to-day it is the largest and most powerful express engine running on the Great Northern Railway system.



Digitized by Google

British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Chas. S. Lake.*

SOMERSET AND DORSET JOINT RAILWAY 2-8-0 ENGINE, NO. 85.

Hauling a down coal truck train on the Midland Railway from Cricklewood (Brent Sidings) to Wellingborough.

AFTER Mr. J. G. Robinson's experiment on the Great Central Railway in multi-cylinder high-pressure propulsion, as embodied in his new 4-cylinder express locomotive No. 1169, *Lord Faringdon,* comes that of Mr. H. N. Gresley on the Great Northern Railway, in this case a 3-cylinder "Consolidation" or 2-8-0 type engine—No. 461—which formed the subject of an illustrated article in last month's issue. A curious point is that Mr. Robinson had already tried the 3-cylinder principle by converting his 2-cylinder "Atlantic" No. 1090 from a 2-cylinder to a 3-cylinder engine (subsequently building the heavy Wath shunting 0-8-4 tank engines with the same arrangement of cylinders), whereas Mr. Gresley had converted one of the Ivatt 2-cylinder "Atlantics"—No. 279—into a 4-cylinder machine. In these new constructions, therefore, the one designer increases his three cylinders to four, while the other drops from four to three! I belive I am right in saying that this is the first multi-cylinder goods locomotive yet built in the British Isles using simple expansion only. There are certainly the 0-8-4 banking engines on the Great Central Railway just mentioned, and the corresponding 4-8-0 locomotives on the North Eastern Railway, but these are tank engines in each case, designed expressly for high initial tractive efforts in marshalling yards, and not for continuous running. Beyond these there remain the 50 "Atlantics" of class Z, and the 20 express tank engines of class D on the North Eastern Railway, Sir Vincent Raven having consistently and most successfully exploited the 3-cylinder principle on this line, together with the experimental Great Central Railway "Atlantic" No. 1090, as the only other examples of 3-cylinder high-pressure propulsion. Apart, therefore, from this fairly extensive North Eastern experience, Mr. Gresley has launched out in quite a new direction; in fact, so far as engines for long-distance goods service are concerned, he is acting as a pioneer.

Proportionately as greater tractive power is required, and boilers and cylinders are enlarged to meet the enhanced demand, the point is reached at which a single pair of cylinders can no longer be mounted either between or outside the frames. The extreme limit of cylinder diameter between the frames on the 4 ft. 8½ in. gauge may be taken as 21½ in., and outside them as 22 in., in cases where the line concerned is amply provided for in the matter of lateral loading gauge. Beyond these limits, or even before they are reached, owing to the heavy weight of reciprocating and

Digitized by Google

rotating parts, and the difficulty of balancing them properly, it becomes desirable to reduce the diameter of the cylinders by increasing their number, the principal objection to this course being that of the multiplication of parts. So far as valve-gear is concerned, however, it has been a comparatively simple matter to operate the four valves of four cylinders from two sets of valve-gear, by means of rocking shafts, and, needless to say, the balancing of the engine has been much simplified by the reduced weight of the moving parts and the use of four cranks dividing up the circle equally, instead of two cranks at right angles to each other. A still more even turning movement is obtained by the use of three cylinders, with the cranks set at 120 deg. to each other, but the chief objection to this course hitherto has been the necessity of providing three sets of valve-gear.

This difficulty Mr. Gresley has got over by patenting an arrangement whereby the piston-valve of the inside cylinder is operated jointly by both sets of outside Walschaert motion, the symmetry of the mechanism being thereby preserved. In the simplest form of this valve-gear, when the three valves are in the same plane, an ingenious system of two levers only, worked from the outside valve-rods, suffices to operate the centre valve, but the inclination of the cylinders in the case of this new engine has compelled a slightly more complicated form of motion, the centre piston valve being at the left-hand of the inside cylinder instead of above it. The three cylinders, however, are arranged in line, and are inclined sufficiently (at 1 in 8) to allow the centre connecting rod to clear the leading coupled axle, driving being effected on the second coupled axle by means of three connecting rods of the same length. Cylinders are 18 in. diameter by 26 in. stroke, and are almost exactly equivalent in volume to two cylinders 22 in. by 26 in., as compared with the 21 in. by 28 in. cylinders of Mr. Gresley's previous 2-8-0 engines. A long piston stroke has never been popular on the Great Northern Railway since the days of Patrick Stirling's 8 ft. single-wheelers, and, while thus increasing the equivalent diameter of his cylinders, Mr. Gresley reverts to his more customary 26 in. stroke. The nominal tractive effort of the new 2-8-0 is slightly more than that of the previous 456-460 batch—to be exact, 32,605 lb. as against 31,862 lb., at 85 per cent. boiler pressure—but so far as boiler dimensions and weight are concerned, there is practically no difference between the two types, as the

Photo] [*P. S. A. Berridge.*

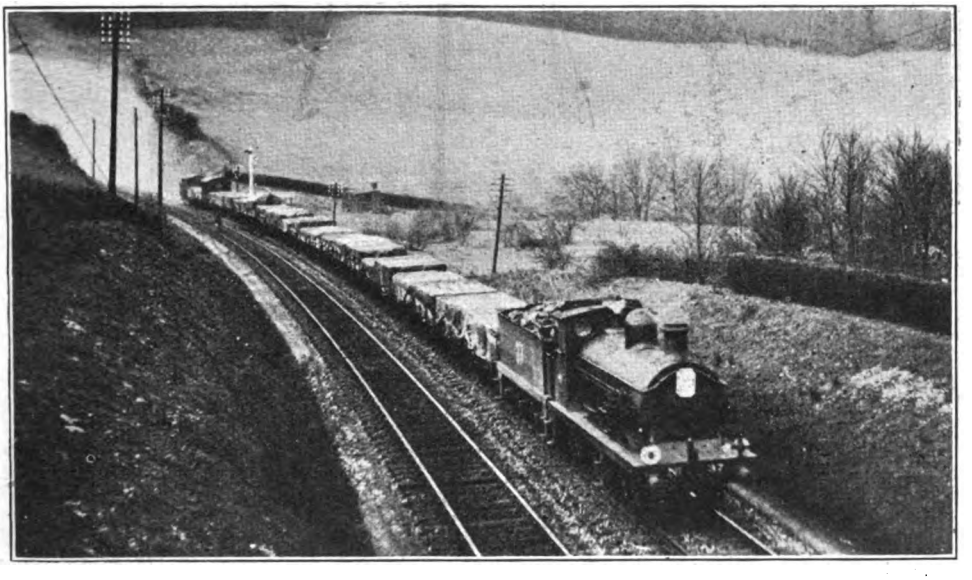
LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Up slow train hauled by 4-6-2 tank engine, No. 325, *Abergavenny*.

Digitized by Google

dimensions given in the last issue clearly show. The continued enterprise of Doncaster and Gorton under such conditions as the present is worthy of remark, and the work of these latest fine examples of the designing ability of Mr. Gresley and Mr. Robinson will be watched with considerable interest.

I have recently received a plaint from an old friend, whom I well know to be an ardent Midland enthusiast, to the effect that the locomotive work of that company has received scant attention in these columns for some time. On looking back over past numbers I must admit the impeachment, as the last series of Midland runs appeared in March, 1917, but, truth to tell, the super-drastic treatment of the Midland time-tables from the beginning of 1917 and subsequently has stripped every vestige of interest from the locomotive performance of that line. Maximum speed restrictions, which I now find to be as severe as 40 m.p.h. throughout between Trent and Manchester, and 45 m.p.h. to 50 m.p.h. elsewhere over almost the whole of the Midland main lines, coupled with the most sluggish of uphill work, leave nothing worthy of record, and as I have been endeavouring as far as possible to combine a certain amount of current locomotive work with the description of logs taken before the high tide of deceleration set in, it is not, perhaps, remarkable if I have somewhat neglected the Midland Railway. Especially is this the case in that very little excess over pre-war loads on Midland expresses still suffices to call forth a pilot locomotive, so that one is not able to test the capacity of Midland engines even under war loading conditions—a pastime which still affords a considerable amount of interest on other lines, despite drastic decelerations. However, on turning over my note-books, I find I have still a number of interesting Midland runs of comparatively recent date which have not, as yet, been described in these columns, and I will therefore deal with them forthwith.



Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

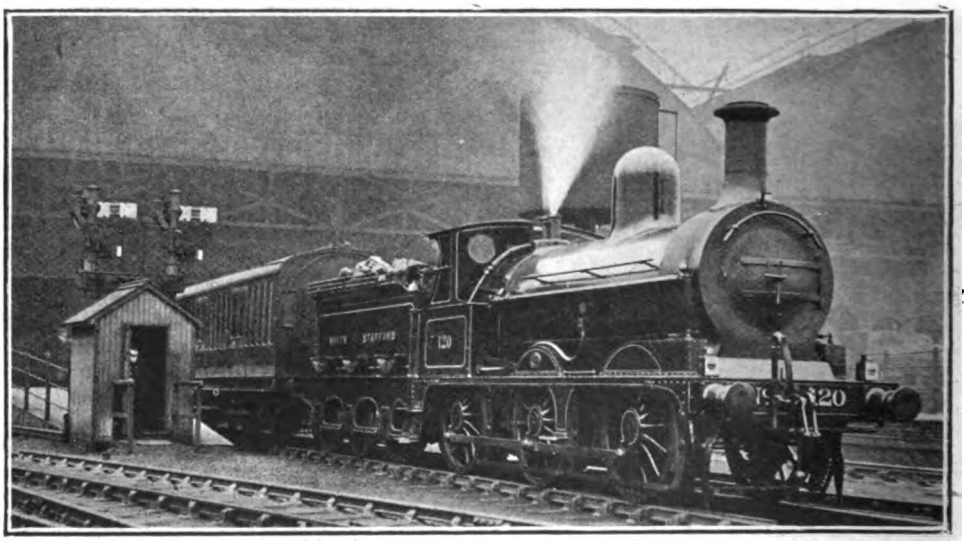
Down goods train emerging from Knockholt Tunnel. 0-6-0 engine, No. 37. There is a Great Western Railway brake van on the train.

The now-cancelled 11.30 a.m. down Scottish express was not, perhaps, a brilliantly timed train, but it generally carried the maximum load for class 4 engines, or something but little short of it, and the 114 min. allowance to Leicester included an invariably made conditional stop at Luton. On two runs with 36 and 38-axle loads respectively, weighing 245 and 246 tons empty, and 260 tons full in each case, the engines were compound

Digitized by Google

4-4-0's Nos. 1029 and 1024. On both runs the trains were banked in rear out of St. Pancras. We passed Hendon, 7 miles, in 10¾ min. and 11 min. 10 sec.; Elstree Summit, 12½ miles, in 17¼ min. and 17 min. 55 sec. (at 46 and 43½ m.p.h.); St. Albans, 20 miles, in 24 min. 55 sec. and 25 min. 55 sec., after attaining 67 and 65 m.p.h. at Radlett and falling to 50 and 46 on the subsequent ascent; and so reached Luton, 30¼ miles, in 36 min. 25 sec. and 37¾ min., No. 1029 having had decidedly the best of it to this point.

Restarting after stops of 35 and 75 sec., i.e., 37 and 39 min. respectively after leaving town, both engines got away smartly, passing Leagrave, 2½ miles, in 5 min. 10 sec. and 5¼ min.; Ampthill, 11½ miles, in 13½ min. and 13 min. 40 sec.; and Bedford, 19½ miles, in 19 min. 50 sec. and 20 min. 10 sec., after which No. 1029, having got through Bedford in the smart time of 56 min. 50 sec. from town, inclusive of the stop, and Sharnbrook in 5 sec. under "even time" from Luton, was very markedly eased. Maxima at Flitwick were 77½ and 74 m.p.h., and before Bedford 79 and 77½, with intervening minima of 72½ at Ampthill in each case. Up Sharnbrook bank No. 1029 fell to 31½ and No. 1024 to 34 m.p.h., the summit, 29½ miles, being passed in 31¼ and 31¾ min.; Wellingboro', 34¾ miles, in 37 min. 5 sec. on both runs; and Kettering, 41¾ miles, in 46 min. 5 sec. and 44 min. 10 sec. The sharp ascent of 6 miles from Kettering to Desborough was compassed by No. 1029 in 8 min. 55 sec. and by No. 1024 in 8 min. 20 sec., the subsequent 5 downhill miles to Market Harborough, where the usual slack was made, taking 5 min. 5 sec. in each case. From there the 5½ miles up to Kibworth occupied 6 min. 35 sec. and 6½ min., and the final 10½ miles down to Leicester, with a slack at Wigston Junction, 11 min. 5 sec. and 11 min. 25 sec. This gave totals of 77¾ min. and 75½ min. from Luton to Leicester, 68¾ miles, and 114¾ and 114½ min. from London, but had No. 1029 run in 1024's times from Sharnbrook to Kibworth, the Luton-Leicester section would have been run in 74½ min., and the London-Leicester stretch, stop included, in the good time of 111¼ min., which is practically equivalent to the 106 min. non-stop schedule.



Photo] [*P. F. Cooke.*

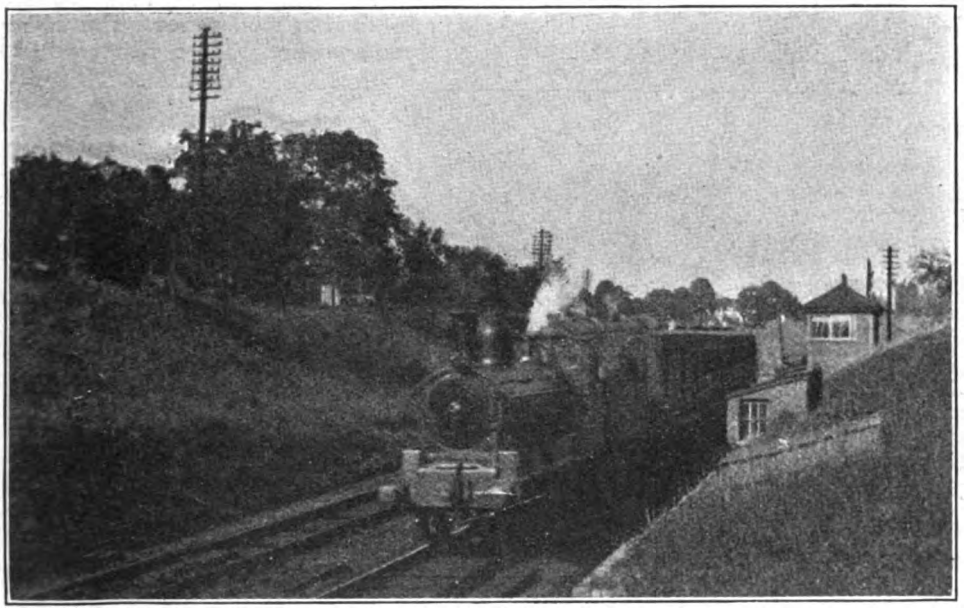
NORTH STAFFORDSHIRE RAILWAY.

0-6-0 tender engine, No. 120, on Potteries train at London Road, Manchester.

Three other excellent runs timed by correspondents, on the late 9.30 a.m., 1.30 p.m., and 2.30 p.m. expresses *ex*-St. Pancras, may also be quoted. The 9.30 a.m. loaded to 40 axles, 251 tons tare and 265 tons full, and the 2.30 p.m. to 41 axles, 244 and 260 tons, worked by com-

Digitized by Google

pounds Nos. 1025 and 1034 respectively. Almost exactly similar starts were made, the times being 11 min. 43 sec. on both runs to Hendon (a remarkable coincidence this), 38 min. 10 sec. and 38 min. 16 sec. to Elstree, 25 min. 40 sec. and 25 min. 53 sec. to St. Albans, and 36 min. 25 sec. and 36 min. 28 sec. to Luton. The initial work was thus not nearly so good as that of No. 1029 on my first run, which bettered these times to St. Albans by 45 and 58 sec., and stopped at Luton in the same time as the two latter engines took to pass that point, under identical conditions of loading. Thereafter some fast running ensued on the last-mentioned runs, Ampthill, 41¾ miles, being passed in 46 min. 31 sec. and 46 min. 32 sec.; Bedford, 49¾ miles, in 53 min. 12 sec. and 53 min. 11 sec.; Sharnbrook Summit, 59¾ miles, in 64¼ min. and 63 min. 33 sec.; Wellingborough, 65 miles, in 69 min. 51 sec. and 68 min. 52 sec.; and Kettering, 72 miles, in 76 min. 47 sec. and 75 min. 33 sec. Here No. 1025, which since Bedford had been gradually falling behind No. 1034, was eased down, which was not surprising, as the allowance of the 9.30 a.m. "Scotsman" to Leicester was 112 min. against the 106 min. of the 2.30 p.m. Manchester express. So the times to Desborough, 78 miles, were 86 min. and 83 min. 25 sec.; to Market Harborough, 83 miles, 92½ min. and 88 min. 28 sec.; to Kibworth, 88½ miles, 99 min. 50 sec. and 94 min. 33 sec.; and to Leicester stop, 99 miles, 111 min. 57 sec. and 105 min. 20 sec. No. 1034 did excellently on the 2.30 p.m. down to complete the heavily-graded 27 miles' stretch between Kettering and Leicester in 29 min. 47 sec. with so substantial a load. The same engine also continued smartly to Derby by passing Loughborough, 12½ miles, in 15 min. 13 sec.; Sheet Stores Junction, 20¾ miles, in 22 min. 22 sec.; Spondon, 26¾ miles, in 29 min. 50 sec.; and reaching Derby, 28½ miles, in 33 min. 38 sec.



Photo] [*A. B. Macleod.*

MIDLAND AND SOUTH WESTERN JUNCTION RAILWAY.

Andover train leaving Cheltenham. 0-6-0 locomotive, No. 25. Coaches are London and South Western Railway stock.

On the now long-defunct 1.30 p.m. down "Scotsman" the work of No. 1001 —one of the five Johnson 3-cylinder compounds rebuilt by Mr. Deeley with superheating apparatus—was magnificent, in face of many disheartening delays, with a load of as much as 44 axles, 261 tons tare and 280 tons full, *i.e.*, 21 tons over the maximum allowed for class 4 engines on this schedule. Banked in rear

Digitized by Google

out of St. Pancras, No. 1001 was through Hendon in 10½ min., at 61 m.p.h.; Elstree in 16 min. 44 sec., at 48 m.p.h.; and Radlett, 15¼ miles, in 19 min. 34 sec., at 68 m.p.h.; but was badly slowed for underline bridge repairs immediately before St. Albans, although passing that town in 24 min. 44 sec. This check cost 2 min., but Luton was passed in 36 min. 41 sec., at 65 m.p.h.; Leagrave in 39 min. 12 sec., at 57 m.p.h.; Ampthill in 47 min. 12 sec., at 71 m.p.h. (following on a maximum of 77 at Flitwick); Bedford in 53 min. 56 sec., at 77 m.p.h.; Sharnbrook Summit in 64 min. 24 sec., at 43 m.p.h. (an excellent figure this, over 3¾ rising miles at 1 in 119, and 2 further miles of preceding up-grade); Wellingborough in 69 min. 18 sec., after attaining 72 m.p.h.; Kettering in 75 min. 59 sec.; Desborough in 83 min. 29 sec., at 45 m.p.h. (this again was a first-class minimum figure); and Market Harborough in 88 min. 20 sec., at 50 m.p.h., reduced from 69 m.p.h. Then, with comfortable time for a punctual finish, there ensued a vexatious p.w. check at East Langton, so that the total time from London to Kibworth was 95 min. 5 sec., and into Leicester 107 min. 16 sec. But the net time did not exceed 103¼ min. for the 99 miles' journey, and I am not surprised that my correspondent regards this fine trip as one of the best Midland compound runs in his extensive collection.

From Leicester to Leeds is not in the best of circumstances a very fast-running section, and the 11.30 a.m. down used to be allowed 117 min. in which to cover the 97 miles non-stop, inclusive of severe slacks at Trent, Clay Cross, Tapton Junction (Chesterfield), and Normanton. On three different runs the loads were in every instance 260 tons, and the engines compounds Nos. 1003, 1000, and 1008, the first two being original Johnson 3-cylinder compounds, now superheated, and the third an ordinary Deeley compound. Brisk starts were made in each case, Loughborough, 12½ miles, being passed in 14½ min., 14¾ min., and 14 min. 20 sec., at 60, 66, and 67 m.p.h.; and Trent, 20¾ miles, in 23 min. 10 sec., 23 min., and 22 min. 50 sec. From Trent No. 1003 covered the 10 rising miles to Langley Mill in 13 min., but was badly checked by signal at Pye Bridge; No. 1000 was brought down to a walking pace at both Trowell and Ilkeston Junction, and took 17 min. 35 sec. to Langley Mill; while No. 1008's time to the same point was 13¼ min. From the last-mentioned point up the steeper 8¾ miles' ascent to Doe Hill Summit the times were 12¼ min. (including check), 11 min. 20 sec., and a leisurely unchecked 12¼ min.; thence to Chesterfield, 7½ miles, inclusive of Clay Cross slack, took 9 min. 25 sec., 9¼ min., and 9¾ min.

After the severe cross-over slack at Tapton Junction the ensuing gentle falling grades to Rotherham were taken, as usual, at comparatively moderate

Photo] [*Chas. S. Lake.*

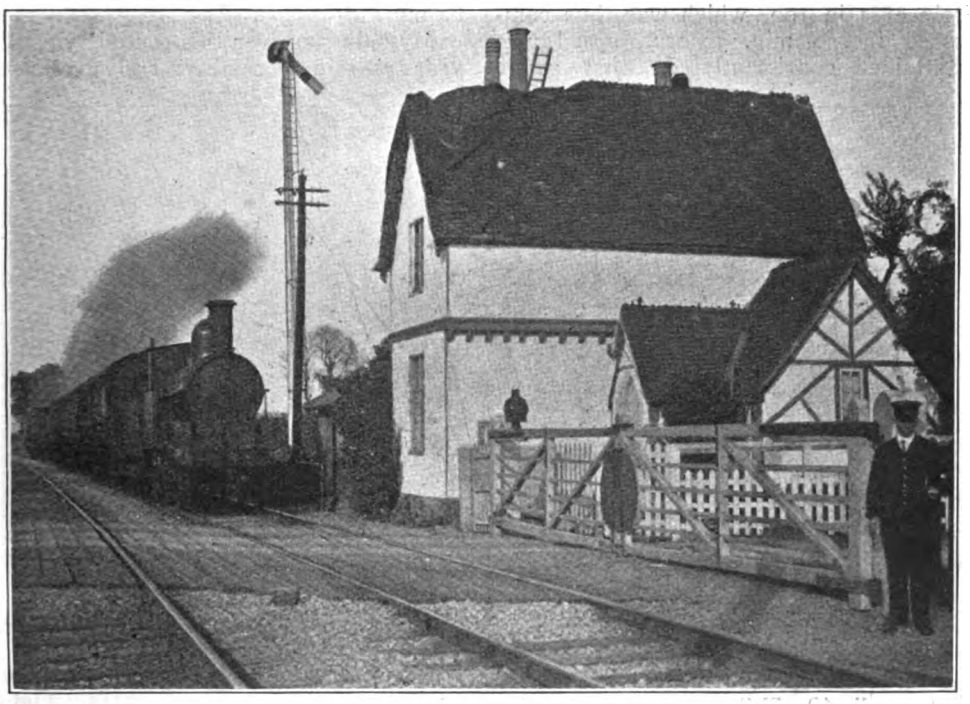
MIDLAND RAILWAY.

Up slow train, Bedford to London, near Millbrook. Rebuilt 4-4-0 superheater engine, No. 552.

Digitized by Google

speed, the 16 miles occupying 19 min. 50 sec. on the first run, including two very bad signal slacks, 16 min. 40 sec. on the second, and 17 min. 10 sec. on the third. On to Darfield, 9¼ level miles, took 10 min. 20 sec., 9 min. 40 sec., and 9¾ min.; thence up to Royston, 6¼ miles, 6¾ min., 6 min. 40 sec., and 6 min. 40 sec.; and from Royston down to Normanton, 7½ miles, 8¼ min., 8 min. 35 sec., and 8¼ min. Despite the long slack through the latter station and on beyond right to Altofts, the remaining 11 miles to Leeds were covered in the smart times of 14½ min. and 14 min. 40 sec. on the first and second runs, but on the third run a p.w. slack was experienced at Woodlesford, and we took 15 min. 10 sec. So the total times from Leicester were 118½ min., 117 min. 25 sec., and 117¾ min., but the net times were 113¾ min., 113 min., and 117 min., the two superheated compounds thus doing well. No. 1000's time of 56¼ min. for the 50 miles from Chesterfield to Leeds in particular was excellent.

Continuing from Leeds on one of the 11.30 a.m. runs, we were horsed by No. 998, one of the 999 class 4-4-0's, now superheated, and took forward a 40-axle train, weighing 233 tons empty and 245 tons full, but were so badly checked on to Hellifield as to take 56 min. 20 sec. for this 36 miles' stretch. On the 9.30 a.m. journey, however, my correspondent was more fortunate, as No. 991 of the same type with 265 tons got through Shipley, 10¾ miles, in 15 min. 35 sec., and Keighley, 17 miles, in 23 min. 28 sec., despite the almost continuous 12½ miles' ascent at 1 in 214-330 from Kirkstall to Keighley, and the slack at Shipley Junction. The 9 undulating miles from Keighley to Skipton occupied 9 min. 12 sec., and the remaining 10 miles into Hellifield, including the severe slack at Skipton Junction, the steep 8 miles' ascent, mostly at 1 in 130-162, thence to the summit beyond Bell Busk, and a bad signal check at Hellifield Goods, 16¼ min. This made a total time to Hellifield of 48 min. 55 sec. from Leeds, but



Photo] *[Chas. S. Lake.*

LONDON AND NORTH WESTERN RAILWAY.

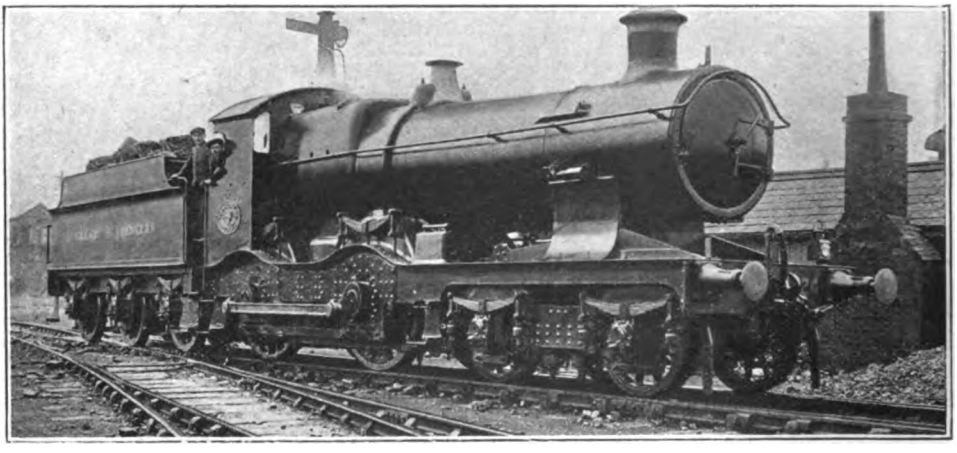
Cambridge-Bletchley train passing Bow-Brickhill Halt (now closed) and level crossing.

Digitized by Google

the net time was not more than 46½ or 47 min.

Out of Hellifield No. 998's load was reduced to 36 axles, 210 tons empty, and 220 tons full, and good work was done up to Ais Gill, despite the fact that we were caught badly by a strong west wind and heavy rain on the exposed stretches of line above Horton. Settle Junction, 3¼ miles, was passed in 4 min. 40 sec., at 64½ m.p.h.; Settle, 5¼ miles, in 6 min. 55 sec.; Horton, 11¼ miles, in 15 min. 40 sec.; and Blea Moor Box, 17¼ miles, in 25¼ min. Up the 14 miles' ascent from Settle Junction to Blea Moor, almost entirely at 1 in 100, which was thus compassed in 20 min. 35 sec., speed was maintained consistently on that grade at exactly 40 m.p.h., except as we approached Blea Moor, where the wind, then of hurricane force, brought us down to 37 m.p.h. For the same reason we could not exceed 60 m.p.h. at Hawes Junction, so taking 9 min. 25 sec. for the 8¼ miles from Blea Moor to that point, and 3¼ min. for the subsequent 3 miles to Ais Gill Box, total 37 min. 55 sec. from Hellifield, 28½ miles. Thence, after touching 75 m.p.h. beyond Mallerstang, we proceeded moderately down to Carlisle, taking 6 min. 5 sec. from Ais Gill to Kirkby Stephen, 6¾ miles; 10 min. 20 sec. on to Appleby, 10¾ miles; 14 min. 55 sec. from Appleby to Lazonby, 15¼ miles (maximum speed, 69 m.p.h.); 5 min. 50 sec. from Lazonby to Armathwaite, 5½ miles, including the 1¾ miles' ascent at 1 in 165, on which speed fell to 49½ m.p.h.; and 6 min. 55 sec. from Armathwaite to Scotby, 7¼ miles. The final 2¾ miles into Carlisle were hampered by signal checks, and occupied 4 min. 25 sec., making a total time of 86 min. 35 sec. for the 76¾ miles from Hellifield, and about 85½ min. net. But with faster running from the Summit—the 48¼ miles having occupied as much as 48 min. 40 sec., or about 47¾ min. net—the journey from Hellifield might easily have been completed in 83 or 84 min.

My only run over this route during last year was in December, and was made on the 9.10 a.m. *ex*-St. Pancras. Out of Leeds No. 991 took a 48-axle load unpiloted, the tare weight of the train being 317 tons, but as a large number of passengers, both first and third, were accommodated in the corridors, including my unfortunate self, the gross weight was fully 345 tons. So No. 991 did well to pass Shipley in 18 min. 25 sec., Keighley in 26 min. 50 sec., and to reach Skipton in 37 min. 55 sec., against a 37-min. schedule, considering the continuously rising character of the road. Here we attached as pilot to Ais Gill No. 470, a rebuilt and superheated 6 ft. 6 in. 4-4-0, and got away in excellent style, passing Bell Busk, 6¾ miles, at a steady 43 m.p.h.,



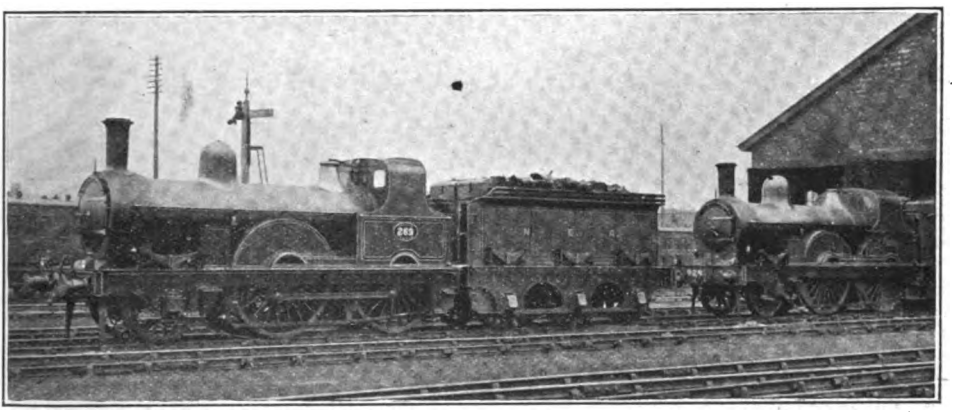
Photo] [*P. F. Cooke.*

GREAT WESTERN RAILWAY.

4-4-0 locomotive, No. 3324, *Glastonbury*. "Bulldog" class, at Patricroft, near Manchester (London and North Western Railway).

Digitized by Google

in 10 min. 20 sec., and maintaining 41½ m.p.h. to the summit of the 1 in 131. Hellifield, 10 miles, was passed in 14 min. 50 sec., and Settle Junction, 13¼ miles, in 18 min., at 64½ m.p.h. But the subsequent uphill work was not so good as on the last trip, the 8 miles from Settle Junction to Horton taking 12 min., and the 6 miles thence to Blea Moor, 10¾ min., total 22¾ min., while speed varied mostly between 31 and 36 m.p.h. From Blea Moor to Hawes Junction occupied 10 min. 10 sec., and thence to Ais Gill stop 3 min. 25 sec. The 38½ miles from Skipton had, therefore, been run in 54 min. 20 sec., and the 28½ miles from Hellifield, pass to stop, in 39½ min. After stopping exactly 60 sec. to detach the pilot, No. 991, running at the most moderate speed (we at no point exceeded as far as Leeds on the 9.20 a.m. *ex*-Glasgow, and thence to London on the 11.0 a.m. from Glasgow. Out of Hawes Junction we took a 57-axle train, weighing 359 tons empty and 385 tons full, No. 182 of the 2-4-0 type piloting a superheater rebuilt 4-4-0, whose number I did not catch. Blea Moor, 8¼ miles, was passed in 10 min. 35 sec., and then we ran fast down to Settle Junction, touching 77½ m.p.h. beyond Ribblehead, and again 79 beyond Settle, with numerous severe intermediate slacks. So the 6 miles from Blea Moor to Horton were run in 5 min., and the 8 miles thence to Settle Junction in 6 min. 40 sec., while the final 3¼ miles into Hellifield took 3 min. 50 sec. This made a smart total time of only 26 min. 5 sec. for the 25½ miles from Hawes Junction to



Photo] [*P. F. Cooke.*

NORTH EASTERN RAILWAY.

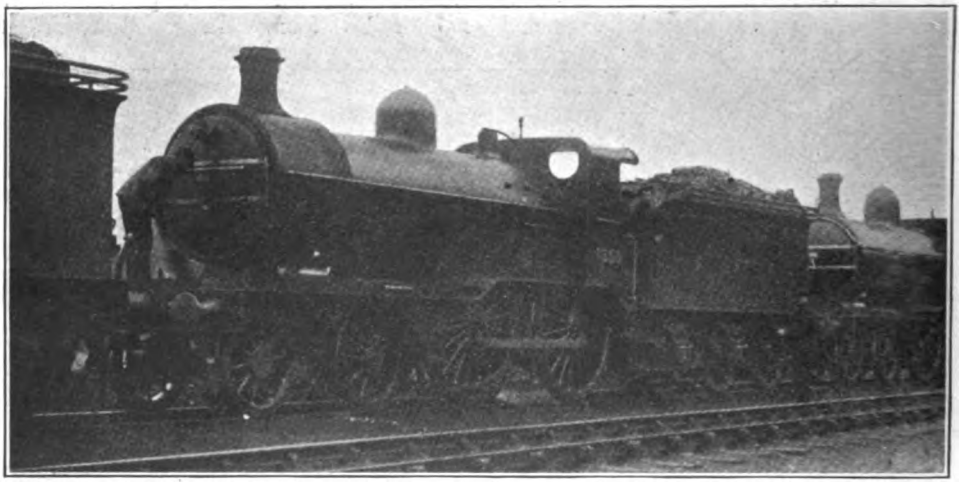
2-4-0 engines, Nos. 269 and 928, class 901, at Bridlington.

69 m.p.h., and mostly ran at much below that figure), passed Kirkby Stephen, 6¾ miles, in 9 min. 10 sec.; Appleby, 17½ miles, in 19 min. 20 sec.; Lazonby, 32¾ miles, in 34½ min.; Armathwaite, 38¼ miles, in 40 min. 40 sec.; and Scotby, 45½ miles. in 47 min. 50 sec.; Carlisle, 48¼ miles, was reached, after delays, in 54 min. 5 sec., or 51 min. net. Total time from Skipton, 86¾ miles, was thus 109 min. 25 sec., or 106¼ min. net, which was decidedly above the level of contemporary Midland performance, and was well inside the 113 min. allowed.

I might also quote a return journey from Hawes Junction to London late in 1916, which had some features of interest, Hellifield. Restarting with 310 tons from Hellifield, the rebuild, now unassisted, touched 64½ m.p.h. at Gargrave, and, after reducing speed at Skipton Junction, passed Skipton, 10 miles, in 13 min. 20 sec., but, unfortunately, we were most severely checked by signal at Steeton. So the 9 miles from Skipton to Keighley took 12 min. 10 sec., and the 6¼ miles thence to Shipley Junction 7 min. 20 sec. (here we slacked severely, as usual), the final 10¾ miles into Leeds occupying 13 min. 10 sec. Total time for the 36 miles was thus 46 min., but net time was not more than 42½ min, such work for an unpiloted engine of class 2 with 310 tons being quite good

Digitized by Google

My continuation journey to London was interesting, in that the load was the largest I have ever recorded on a pre-deceleration Midland booking, namely, 61 axles out of Leeds and 65 from Sheffield. This total included a launch on a truck, and a couple more light vehicles, the tare loads being 381 and 408 tons from Leeds and Sheffield respectively, and the gross loads 410 and 440 tons, as both compartments and corridors were packed. Throughout to Leicester we were hauled by a superheater rebuilt 4-4-0, piloted by a small 2-4-0, and the work performed by these engines was remarkably fine, in view of the fact that the maximum tare load for the combination was exceeded by this occasion should have brought us into Sheffield at least 6 min. earlier. Out of Sheffield, despite the considerable excess over our scheduled load, we only lost 80 sec. to passing Clay Cross, including the conditional stop at Chesterfield (for which 3 min. was allowed over and above non-stopping times), getting up the 1 in 100 to Dore, 4¼ miles, in 10 min. 25 sec., and reaching Chesterfield, 12¼ miles, in 21¾ min. Restarting, after a stop of 40 sec., we climbed to Clay Cross, 4 miles, in 6 min. 55 sec., and Doe Hill, 7½ miles, in 12 min. 10 sec., but thereafter we were cruelly checked by adverse signals all the way to Trent, taking in all 39 min. 40 sec. for the 26¼ miles from Chesterfield. Unchecked, but inclusive



Photo] [*J. Macartney Robbins.*

GREAT NORTHERN RAILWAY.

4-4-0 rebuilt engine, No. 1359, at Peterborough.

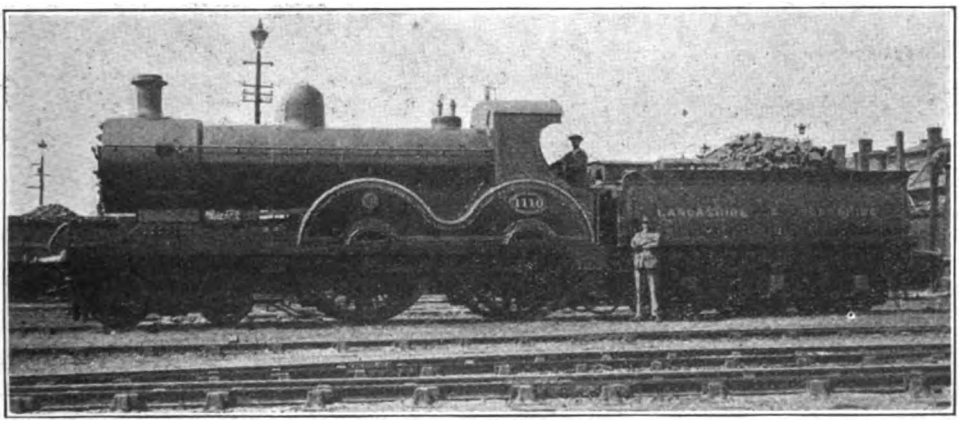
11 tons to Sheffield, 78 tons thence to Chesterfield, and 38 tons on to Leicester. From Leeds we passed Normanton, 11 miles, in 13 min. 55 sec., touching 64 m.p.h. at Woodlesford, and then slacking carefully over Altofts Colliery workings; Royston, 18½ miles, in 24½ min.; Cudworth, 21 miles, in 26 min. 40 sec.; and Swinton, 29 miles, in 33 min. 40 sec.; speed having been maintained for some miles between the last-mentioned points at 69 m.p.h. Then followed a string of signal checks, so that the 39½ miles from Leeds to Sheffield eventually occupied 52 min., as scheduled, but such brisk running as was displayed on of Chesterfield stop, we could easily have run from Sheffield to Trent in 54 min., instead of the 59 min. allowed, showing a potential gain of 11 min. from Leeds to Trent on the part of these two engines. But on to Leicester the running was by comparison poor, as we took 26 min. 5 sec. for the level 20¾ miles, and thereby lost 2 min.

At Leicester we attached that most formidable of speed combinations—a "Princess of Wales" 4-2-2, No. 688, piloting a 4-4-0 compound, No. 1036—and also reduced the load by the loss of the smaller vehicles to 57 axles, 374 tons tare and 400 tons full. I was not sorry for the

Digitized by Google

reduction, as I cannot say I relished the presence of a 4-wheeled truck next the engines on a 105-min. Leicester-London "sprint." Unfortunately, as we were running very late, the 4.20 p.m. from Manchester had preceded us, so that it was necessary to stop at Kettering to set down passengers. This initial run was brilliantly performed, as we ascended to Kibworth, 10¼ miles, in 13 min. 35 sec., passing that point at 51 m.p.h.; touched 77½ m.p.h. at East Langton and were through Market Harborough, 16 miles, in 18 min. 50 sec.; passed Desborough, 21 miles, in 24½ min. (having only fallen to 44 m.p.h. on 4 ascending miles at 1 in 132); and reached Kettering, 27 miles, in 31 min. 10 sec., after attaining 75 m.p.h. on Glendon bank. The time to Kettering would have been even less but for the necessity of stopping slowly there in order to draw the long train to the platform. From Kettering, again, we made a brilliant start, passing Wellingborough, 7 miles, in 8 min. 35 sec., at 69 m.p.h., but there, alas! we ran into the signals of the Manchester train and were stopped dead at Irchester, the 15¼ miles from Wellingborough to Bedford taking 19 min. 35 sec.

At Bedford we were again doing 68 m.p.h., and mounted the 7 miles (mostly at 1 in 200) culminating at Ampthill at a minimum rate of 50 m.p.h., and the subsequent 6¼ miles at 1 in 202 up to Toddington with no lower rate than 46 m.p.h. So the 8 miles from Bedford to Ampthill took 8 min. 10 sec., and the 11½ miles thence to Luton 13¼ min. Passing Luton at 67 m.p.h., we ran the 10¼ miles on to St. Alban's in 9 min. 50 sec.; the 7½ miles thence to Elstree in 6 min. 25 sec., with a maximum of 72½ m.p.h. at Radlett (the engines were here running under easy steam) and a minimum of 55½ at Elstree; the 5½ miles from Elstree to Hendon, passed at 76½ m.p.h., in 5 min. 5 sec.; and the 5½ miles from Hendon to Kentish Town in 6¼ min., making a total of 77 min. 10 sec., or 71¼ min. net, for the 70½ miles from Kettering. Outside St. Pancras we had to wait some time until a platform was vacated; otherwise we should have arrived in 80 min. from Kettering, 72 miles, or 74 min. net, with a clear road. Making careful allowance from contemporary runs for the Kettering and Irchester stops, as well as the final delay, I estimate the work on this trip as equivalent to a non-stop time from Leicester of 101¼ min., which evidenced exceedingly fine work, even for two engines, with a 400-ton train over such a road as the Midland.



Photo] [*W. H. Whitworth.*

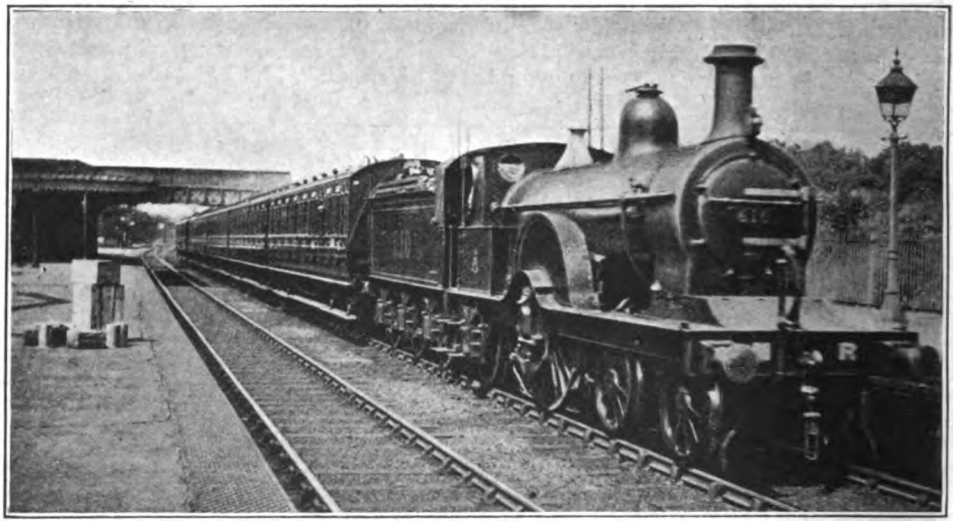
LANCASHIRE AND YORKSHIRE RAILWAY.

4-4-0 locomotive, No. 1110. Rebuilt with superheater, "pop" safety valves, and inside Walschaert valve gear.

I will conclude by describing an altogether exceptional run behind No. 1040—the first of the 4-4-0 compounds to be superheated—for details of which I am indebted to the kindness of my well-known and greatly enjoyed co-contributor, Mr. E. L. Ahrons. The train concerned was the 11.20 a.m. *ex*-Leeds, as

Digitized by Google

was unusually heavy for an unpiloted Midland express, totalling as it did two 12-wheeled "diners," eight 8-wheeled corridor cars and a 6-wheeled brake, 47 axles, 296 tons empty, and 315 tons with a very full load of passengers and luggage. This train was allowed a working time of 86 min. from Kettering to St. Pancras inclusive of a conditional stop at Cricklewood to set down, and was on this occasion running ¼-hour behind time. No. 1040 got away smartly from Kettering, as, despite slacking to cross from slow to fast roads at Kettering South, she hill 8 miles' length was run in 8 min. 3 sec., the 7¾ miles thence to Toddington summit in 9 min. 42 sec., and the 3¾ miles on to Luton in 4 min. 13 sec.—total 21 min. 58 sec. from Bedford and 45 min. 47 sec. from Kettering. The 10¼ miles from Luton to St. Alban's were covered in 9 min. 35 sec., the 7½ miles thence to Elstree in 6 min. 31 sec., with a maximum of 77 m.p.h. at Radlett, and the 5½ miles from Elstree to Hendon in 4 min. 58 sec., the 18½ miles between posts 25 and 6½ occupying only 16 min. 29 sec. So Cricklewood, 66¾ miles from Ketter-



Photo] [*F. H. Stingemore.*

MIDLAND RAILWAY.

Up stopping train at Radlett. 4-2-2 engine, No. 610.

was through Wellingborough, 7 miles, in exactly 9 min., at 62 m.p.h., and mounted the 5¼ miles ascent thence to Sharnbrook Summit in 5 min. 56 sec. The last complete mile of the 1 in 120 (between posts 61 and 60) was run at 44 m.p.h., and some very high speed followed, the 10 miles between posts 58 and 48 occupying 8 min. 17 sec. only, with a maximum of 78½ m.p.h., so that Bedford, 22¼ miles, was passed in 23 min. 49 sec. Speed fell to 49½ m.p.h. at Ampthill and 43 at Toddington, but the Bedford-Ampting, was reached in the really magnificent time of 69 min. 5 sec. from the start, and a non-stop run into town would have been completed easily in between 75½ and 76 min. It would be difficult to find a finer specimen than this of the work of a Midland compound, in view of the 315-ton train load, and it can only be hoped that the termination of the war may witness a recrudescence of such exploits, with which one associates Midland performance far more readily than the funereal progress enjoined by the current time-tables.

Digitized by Google

Highest Mountain Railway:

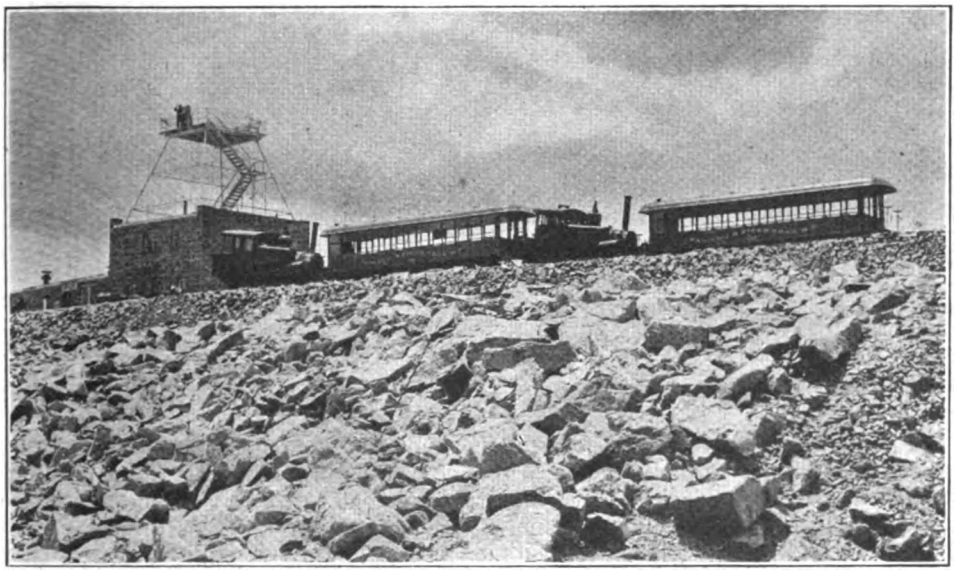
MANITOU AND PIKE'S PEAK LINE, U.S.A.

By R. W. A. SALTER.

SWITZERLAND is the home of mountain railways, but it by no means possesses the loftiest. Manitou and Pike's Peak Railway, Colorado, U.S.A., claims that record. In connection with this statement the following table, showing the height above sea level at which several remarkable mountain railways terminate, is worthy of note :—

Manitou and Pike's Peak Rly., U.S.A.	14,109 feet.
Jungfrau Railway, Switzerland... ...	13,667 „
Pilatus Railway, Switzerland	6,963 „
Rigi Railway, Switzerland	5,832 „

On arriving at the station one's first attention is centred on the novel train, but of that a description is given later. Casual travellers who make the ascent fail to realise the perils which attended the survey and construction of this road. Its feasibility as now constructed was conceived in 1888, and some preliminary surveys were made in that year. Grading was begun in 1889 (three years after the completion of the Pilatus Railway, in Switzerland), and the golden spike driven October 20th, 1890. The first project for building a line to the summit, however,



SUMMIT HOUSE.
At the summit of Pike's Peak "Cog Road."

The Manitou terminus of the popularly-termed "Cog Wheel Route" is situated at the mouth of Engleman's Glen, close to the famous Ute Iron Spring. The tramway from Colorado Springs, a thriving city lying a little lower down at the foot of the mountain, terminates at the station platform.

was formulated in 1884, work begun, and nearly 8 miles graded for a line which was intended to reach that point by a circuitous route 30 miles in length, with a 5 per cent. maximum gradient; but insufficient capital occasioned by adverse opinions as to the ultimate success of the scheme caused the work to be abandoned.

Digitized by Google

One of the steepest grades on the line is encountered soon after leaving Manitou station. The train passes through Engleman's Glen, which now has merged into a canyon-like defile, and here hugs closely the left wall. On the right, in a yawning gulch, the Ruxton churns and splashes through a bed of giant boulders.

A quaint hamlet of rustic cottages—Minnehaha—is the first stop; while next, through scenes of ever-changing beauty, the Half-Way House is reached. Besides the termini there are six stations on the line, and three tanks for the locomotives.

Some way after Half-Way House the scene expands. Trees desert the landscape and groups of stunted aspens take their place. The verdured hills shrink back and leave big bleak peaks; while rocks, gaunt and jagged, line the immediate way. As the train gains in elevation the air grows chill. In the early season snow lies everywhere, and the opening of the road in spring involves cutting through enormous depths of ice and snow.

Quite unexpectedly—90 minutes from the time of starting—the train halts on the summit, where one gazes with awe and amazement at the frightful abysses and precipitous valleys of the Colorado landscape.

In its ascent to so great an elevation the Cog Wheel Route has travelled through five zones of temperature—the Transition zone, Canadian zone (sea-level in Canada), Hudsonian zone (sea-level in Hudson's Bay region), and, finally, at 10,000 ft., the Alpine zone (sea-level in Arctic regions). The timber-line occurs, at 11,500 ft., in the last-named zone.

In length the road is 47,992 ft., and the average grade 16 per cent., or 844.8 ft. to the mile. The maximum grade is 25 per cent., and the sharpest curve 16 degrees, or curve with a radius of 359 ft.

The present equipment consists of six locomotives and six passenger-cars. The locomotives, built by the Baldwin Locomotive Works, are of the 4-cylinder Vauclain compound pattern; the high and low pressure cylinders are 10 and 15 in. in diameter respectively, and 22 in. stroke. The steam pressure carried in the boiler is 200 lb. Each engine is provided with two double steel cog-wheels, through which the power is applied; extending from the sides of the wheels are four corrugated surfaces, upon which the powerful steam and hand brakes do their work. Any one of these brakes is sufficiently powerful to stop the engine and train. The steam cylinders are also fitted with the Le Chatlier water brake, and are utilised on the downward journey as air compressors to regulate the speed of the train.

SUMMIT OF PIKE'S PEAK "COG ROAD."

Digitized by Google

The coaches precede the locomotives on the ascent and trail behind them on the descent. The two, however—contrary to what might be expected—are never coupled together; the coaches are provided with powerful individual brakes, which work through cogs on the rack rail, by which arrangement the coach can be stopped instantly and independently of the locomotive.

Each car seats 50 persons, and seats are arranged so that passengers have at all times a level sitting. They are largely of glass so as to facilitate observation.

The roadbed varies from 15 to 20 ft. in width, and, being built upon or cut in solid rock in many places, is fairly substantial. There is none of the wooden trestle-work commonly found in America; the four short bridges are of iron, resting on solid masonry. To prevent displacement of the track either by its weight, the effect of varying temperatures on iron or steel, or by other mishap, 146 anchors are embedded in the solid rock on being exerted on the rack rails. The latter are manufactured of Bessemer steel, with teeth cut from the solid piece by machines especially constructed for the purpose. They are 80 in. long, and differ in weight from 21 to 31½ lb. per ft., the heaviest ones being used on the steeper grades. In the centre of the track is the rack ladder, which is formed by two rack rails set 1⅝ in. apart, which are firmly held by four bolts (two in the centre and one at either end) to three die-forged chairs, which, in turn, are securely fastened to the extra long and heavy sleepers. The rack rails are laid so as to break joints, and the teeth are also staggered, thus giving the two double wheels of the locomotives practically an even bearing at all times. This system of rack rail is known as the Abt, and is similar to that on the Pilatus and other railways in Switzerland.

The following table shows the timing of trains on the Cog Wheel Route, and gives also distances and elevations:—

Down trains.		Miles.	Stations.		Elevation.	Up trains.	
p.m.	a.m.					a.m.	p.m.
3.50	11.45	0.00	Leave Summit	arr.	14,109	11.05	3.10
—	—	1.77	„ Saddle House	„	12,502	—	—
4.09	12.04	2.25	„ Windy Point	„	12,129	10.42	2.47
4.30	12.25	4.28	„ Mountain View	„	10,012	10.12	2.17
—	—	4.86	„ Ruxton Park	„	9,705	—	—
4.43	12.38	6.27	„ Half-way House	„	9,010	9.53	1.58
4.51	12.46	7.06	„ Minnehaha	„	8,332	9.45	1.50
—	—	7.74	„ Butterworth Flat	„	7,793	—	—
5.05	1.00	8.90	Arr. Manitou	leave	6,562	9.25	1.30

masonry at distances from 200 to 1,400 ft. according to the grade.

The T (40 lb. per yard—usually found in the States) are the ordinary rails used; these, spiked direct on the sleepers, being laid at standard gauge. The office of these rails is merely to carry the weight and guide the train, all the impelling force

From June 15th to September 15th extra trains are run between 8 a.m. and 9.25 a.m. and 1.30 p.m. and 2 p.m.; while during the months of July and August special "sunrise trains" are run on Wednesday mornings, leaving Manitou at 2.30 a.m. The fare to the summit and back is £1.

Digitized by Google

The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Before asking for information concerning railway history and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," a new edition of which has just been published, price 5s. net. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

An Accident Record Query.

There is no error in the table on page 30, "Railway Year Book, 1918." The book is correct in stating that no passengers were killed in train accidents in the United Kingdom in the year 1901. True, six deaths from accidental suffocation followed the firing of a train in the Dingle Tunnel of the Liverpool Overhead Railway on December 23rd, 1901, but four of the victims were railway servants and not passengers. Two members of the public lost their lives, but they likewise were not killed in the train. The facts are as follows:—The train was approaching the Dingle Terminus through the tunnel, when it stopped suddenly in consequence of an accident to the rear motor, supposed to be from a firing of the armatures. Almost directly afterwards the guard's compartment at the rear, where the motor was placed, took fire, and the flames, fanned by a strong gale blown through the tunnel from the rear, spread so rapidly that in a few minutes the whole train was on fire, and the conflagration spread to the station and another stationary train, the platform, signal box, etc., being destroyed. At first the passengers, who numbered about 30, kept their seats, but on the fire making headway they left. The majority succeeded in making their escape through the station. Meanwhile, a few who lingered to watch the fire were menaced by an unheeded danger. Heavy smoke rolled into the station, filling the staircases and obscuring everything. When at last the alarm was taken many onlookers narrowly escaped suffocation, and two, Mr. Forbes I. Bingham, a solicitor, and James Beadon, master forgeman, lost their lives. Like the "Railway Year Book," the Governmental returns issued by the Board of Trade do not treat the deaths of these persons as a "train accident."

[Reply to "B. E. F., France."]

Shrewsbury and Hereford Joint Line.

Built as a separate concern, the Shrewsbury and Hereford Railway was opened from Shrewsbury to Ludlow on April 20th, 1852, and from Ludlow to Hereford on November 6th, 1853. It was leased jointly to the Great Western and London and North Western Railways on July 1st, 1862, in circumstances with which we have not space to deal in these columns, and was finally acquired outright by these companies, under the L. and N.W.R. Additional Powers Act of 1870, as from the beginning of 1871. For further information you should consult the article on this line which appeared in the RAILWAY MAGAZINE of January, 1908. You are wrong in stating that the L. and N.W.R. have no interest in their access to Hereford, seeing that this joint line forms the only direct means of communication with their system in South Wales, running powers being exercised for this purpose over the G.W.R. from Hereford to Abergavenny.

[Reply to J. R. HARDING.]

Cuffley-Stevenage Line, G.N.R.

Distance by this route from London to Stevenage is slightly greater than by the main line, and the gradients are heavier, but the advantage secured, in addition to possessing a "relief" route, is that of tapping new country, and especially of putting the county town of Hertford

Digitized by Google

directly on to a main through line. At present there is no physical junction between the Hatfield and Hertford branch and the new line (which passes over the former), but we believe it is the future intention that the branch passenger trains shall use the new passenger station at Hertford, when the latter is completed. Stations are in course of construction at Bayford, between Cuffley and Hertford, and Stapleford and Walton, between Hertford and Stevenage. So far as we are at present advised, there is no intention of widening the Wood Green-Enfield sections.

[Reply to "RIFLEMAN."]

Locomotive Tractive Effort.

An answer in the July RAILWAY MAGAZINE under the heading of "Some Locomotive Queries" dealt with above subject. The formula there given for calculating tractive effort might have been rendered more clear by leaving out the question of pressure in the formula itself, *i.e.*, T (tractive effort per lb. of effective steam pressure in cylinders) $= \frac{d^2 s}{D}$, where d and s = diameter and stroke of cylinders, and D the diameter of driving wheels, all in inches. To arrive at the customary tractive effort at 80 per cent. working pressure, multiply this result by 80 per cent. of the nominal working pressure in lbs. per sq. in. In the same answer "doubts it for a 4-cylinder simple" was obviously a printer's error for "double it."

[Further reply to A. L., Rotherham.]

Furness Railway and the North Eastern Railway.

A through service was run in the summer of 1905 between Newcastle (North Eastern Railway) and Barrow-in-Furness, *vid* Darlington, Tebay, Oxenholme, and Arnside, in connection with the steamer service to the Isle of Man, and we believe that these trains were worked through to Barrow by the North Eastern Railway Company. In addition, special trains have not infrequently been worked through to the Furness line by the N.E.R., in order to overcome the difficulty of arranging for Westinghouse-fitted engines on the L. and N.W. and Furness Railways to haul the Westinghouse-braked coaches of the N.E. Railway. [Reply to "DERBY."]

Platelayers' Trolleys in Tunnels.

So far as we are able to ascertain, it is left to the discretion of the railway company concerned as to which tunnels are included under Rule 9 of the Block Working Regulations (*i.e.*, that platelayers' trolleys shall be signalled through tunnels in the same way as ordinary trains). Undoubtedly density of traffic would constitute the chief factor in deciding which tunnels be so included, but we believe we are right in saying that only the very shortest tunnels, through which it is possible to see clearly from end to end, are in practice excluded. To answer your other query would involve us in a mass of correspondence with the various railways, for which we feel there is not sufficient justification at the present time.

[Reply to R. T. O.]

The Bosch Lubricator.

Engines Nos. 2512, *Thomas Houghton* ("George the Fifth" class), and 1573 *Dunrobin* (superheated "Precursor" class), are fitted with this lubricator, which arranged in the cab, and is operated by a return crank from the crank-pin of the left-hand trailing coupled axle, somewhat after the same manner as certain speed indicating devices. Among other engines equipped with this lubricator (which, by the way, is not likely to make much more headway here on account of its German origin) is No. 238, *F. W. Webb* ("George the Fifth" class). The answer in this connection in last month's magazine under the heading of "Speed Recorders" was given under a misapprehension.

[Further reply to E. H. DOLBY.]

Lynn and Fakenham Railway.

This railway, now part of the Midland and Great Northern Joint, was incorporated in 1876 to construct a line from King's Lynn to Fakenham. It was opened for traffic August 6th, 1880, and in the same year powers were obtained for extensions from Fakenham to Melton Constable, Norwich, Cromer, and Blakeney. The portion from Cromer to Blakeney was abandoned, but in 1881 an extension from Melton Constable to join the Yarmouth and North Norfolk Railway's line at North Walsham was authorised. It was in 1887 that the Holt to Cromer portion was completed.

[Reply to STAFFORD J. HALL.]

Digitized by Google

'Sir Sam Fay" v. "Sir Gilbert Claughton."

We cannot arbitrate on these questions unless readers will say on what basis they propose that the "bigger" shall be reckoned. The "Claughton" is the heavier engine—77¾ tons, against 75¼ tons—but with tenders, in working trim, the order is reversed—*i.e.*, 116¾ tons to 123½ tons. The "Fay" has the bigger heating surface—2,817 to 2,218 sq. ft.—and the "Claughton" the bigger fire-grate area (30.5 to 26 sq. ft.), and working pressure (175 to 160 lb. per sq. in.). As regards tractive effort, the "Claughton" beats the "Fay" handsomely by 22,295 lb. at 80 per cent. working pressure, against 18,990 lb. You may make your own decision from these figures.

[Reply to THOMAS WALNE.]

Engine Head-Codes.

The South Eastern and Chatham, London, Brighton and South Coast, and London and South Western Railways, also the Caledonian Railway in Scotland, all use engine head-codes which differ altogether, both by day and night, from the national standard code of headlights to which you refer. Owing to the complicated network of lines on each of these systems, it is necessary to indicate the routing of trains in the head-codes, and hence the divergence from standard practice. The Great Eastern Railway, for similar reasons, makes variations on its suburban lines, and in connection with its goods working.

[Reply to W. E. SYDAR.]

The "Flying Scotsman."

The train to which this title has always been applied is the 10 a.m. *ex*-King's Cross, G.N.R., running over the East Coast Route (*i.e.*, *via* Peterborough, Doncaster, York, Newcastle, and Berwick) to Edinburgh, and the corresponding return train at 10 a.m. over the N.B.R., N.E.R., and G.N.R. to London. Your friend is altogether mistaken in saying he has seen it at Blackburn, the only Scottish trains passing that town in normal times being the Midland services from Liverpool to Manchester, which are united at Blackburn *en route* to Hellifield and Carlisle.

[Reply to Pte. M. E. HARRISON.]

Gradients between London and Brighton, London, Brighton and South Coast Railway.

A gradient profile of the L.B. and S.C.R. main line from Victoria to Brighton was given in Mr. Cecil J. Allen's article on "British Locomotive Practice and Performance" in the September, 1915, RAILWAY MAGAZINE, a few copies of which are still available. From London Bridge the line is virtually level to New Cross, then rises at 1 in 100 for 2⅝ miles to Forest Hill; a level and undulating stretch (not steeper than 1 in 660) succeeds to Norwood Junction, followed by a rise at 1 in 264 to East Croydon, where the line from Victoria is joined.

[Reply to GILBERT D. NESBIT.]

Longest Railway Lines, Joint Lines, &c.

All the information asked for in the first and second sections of your multiplex query can be found in the "Railway Year Book," where it occupies several pages. It cannot be repeated here. The quality of the passenger rolling stock of each of the three leading English lines you mention is so good that comparisons, if not odious, are at least superfluous. We cannot state the location of a particular locomotive on any given date, and such a vague description as "the last loco. turned out at Crewe" does not help us.

[Reply to J. M.]

Gradients.

It surely must be obvious that we have not the space at our disposal in these columns to give such lengthy lists of gradients as those for which you ask. You could obtain much of this information from Mr. Cecil J. Allen's monthly article on "British Locomotive Practice and Performance"; the principal grades between Euston and Crewe were mentioned in the July, 1916, article, while the chief gradients of the Great Northern Railway of Ireland between Dublin and Belfast were touched on in March, 1913.

[Reply to R. P. V.]

Some North Wales Queries.

No, the North Staffordshire Railway does not now work either goods or passenger trains over the North Wales section of the L. and N.W.R., the only N.S.R. trains working beyond Crewe being the through goods service to and from Liverpool. Your other query is not sufficiently

Digitized by Google

explicit, as there are several trains answering to the description of "Irish Mail." But, seeing that you live "on the spot," why not obtain an answer to these queries by your own observations?

[Reply to CHARLES G. VARCOE.]

Great Western Railway Locomotives.

No new type of locomotive has been built by the Great Western Railway Company during the present year. The most recent engines turned out of Swindon Works have been of the 2-6-0 tender type, for mixed traffic, as illustrated in the coloured frontispiece to the July RAILWAY MAGAZINE. If you will consult the preface to these columns you will see that we do not undertake to answer queries relative to names of locomotives.

[Reply to C. K. SHONE.]

"The Great Bear," Great Western Railway.

It is impossible to say what train or trains are being worked by individual engines at any given moment. As we have replied on several occasions, the above engine, in normal circumstances, takes her turn on both express passenger and goods working between London and Bristol. A letter was recently received from a reader stating that "The Great Bear" was in the paint shops, and being endowed with a new livery.

[Reply to G. W. M. R.]

Great Western Railway Coaching Stock.

The Great Western Railway owns a few corridor coaches with vestibule connections at one end, and a guard's and luggage compartment without gangway at the other, but we are unable to state the exact date when these vehicles were built. There are some similar East Coast Joint Stock carriages, and others on the Great Eastern Railway, but none, so far as we are aware, on the London and North-Western Railway.

[Reply to M. H.]

Cambrian Railways and Crewe.

There is no regular working of Cambrian Railways engines into Crewe, L. and N.W.R., but under special arrangements trains are occasionally worked through from Whitchurch by the Cambrian Company. The L. and N.W.R. does not work into Oswestry, but you may be thinking of the G.W.R., which works its own passenger service between Gobowen, on the Shrewsbury-Chester main line, and Oswestry.

[Reply to THOMAS WALNE.]

Mr. J. Holden's "Decapod," G.E.R.

Owing to its great weight and the consequent strain on underline bridgework, which the traffic of the period did not afford justification for strengthening, this engine was converted into a 0-8-0 type goods engine in 1906 (although in reality but little of the original "Decapod" remained after the conversion), and was finally scrapped some years ago. The number 20 is not at present allotted in the G.E.R. locomotive stock.

[Reply to G. CHRISTY.]

North Staffordshire Railway and Manchester.

In order to reach Manchester the through trains of the North Staffordshire Company travel from Stoke-on-Trent *viâ* Congleton to Macclesfield, passing in that town on to the metals of the L. and N.W. Railway at Hibel Road Station. From there the N.S.R. exercises running powers over the L. and N.W. line *viâ* Cheadle, Hulme and Stockport into Manchester (London Road).

[Reply to W. P.]

The "Flying Dutchman."

For many years the title of "Flying Dutchman" has been practically extinct, owing to the extensive reorganisation of G.W.R. West of England train services consequent upon the opening of the short route *via* Westbury. It used to belong to the 11.45 *ex*-Paddington to Bath, Bristol, Exeter, Plymouth, and Penzance, and the train concerned could, therefore, be seen at Teignmouth, as you say.

[Reply to Pte. M. E. HARRISON.]

Urie 4-6-0 Engines, London and South Western Railway.

These are the engines of the 2-cylinder superheated 4-6-0 type (Nos. 482-491), together with No. 335, which has been converted from the 4-cylinder to the 2-cylinder type by Mr. Urie, and is now almost identical with the former batch. These engines are employed principally on express goods service between Waterloo, Southampton, and Salisbury.

[Reply to C. L. B.]

Digitized by Google

4-2-2 Locomotives.

Most of the engines of this wheel arrangement still at work are found on the Midland Railway, but the North Eastern, Great Northern, and Great Western Railways still have a few in service, while one—the famous No. 123—is, we believe, still extant on the Caledonian Railway.

[Reply to T. HOLLOWAY.]

Mersey Railway.

Conversion from steam to electric traction took place on this line in 1903. The transformation was made in a single day. The steam trains ceased running at night, and the full service of electric cars commenced on the following morning. The first steam train passed through the tunnel December 22nd, 1885.

[Reply to ARTHUR COX.]

4-6-0 Engine, No. 443, L. & S.W.R.

Water-pick-up apparatus was fitted on the tender of this engine at the time of its construction, but we cannot say whether or not it has been retained to the present time. No. 443 has been rebuilt with superheater by Mr. Urie, in common with all the other engines of this series.

[Reply to T. HOLLOWAY.]

Great Eastern Railway Engine, No. 1900.

This locomotive, named *Claud Hamilton,* was exhibited at Paris in 1901. The Company was awarded a "Grand Prix," and the designer, Mr. J. Holden, the then Locomotive, Carriage and Wagon Superintendent of the Great Eastern Railway, received a gold medal.

[Reply to GEORGE COLE.]

North Eastern Railway Locomotives.

Presumably the "beat" of the N.E.R. engines when standing stationary, to which you refer, is the exhaust of the Westinghouse brake-pump, and may be heard on any Westinghouse-fitted locomotive.

[Reply to RALPH B. WALLIS.]

The "Most Powerful" Goods Engine.

No, the engine you name is not the most powerful locomotive in this country, as a brief study of the dimensions of large goods engines illustrated in the RAILWAY MAGAZINE of recent months will amply demonstrate.

[Reply to E. L. SEARLE.]

Railway Mileage.

You can extract full particulars of the mileage of the L. and N.W. and G.W. Railways, including length of single track, double track, third and fourth tracks, etc., from the current edition of the "Railway Year Book."

[Reply to "MOGUL."]

Transport in the Provinces.

There is the Prime Minister's authority for the statement that after the war thousands of motor vehicles and many miles of light railway material will be used to develop traffic in rural districts.

[Reply to "COLOURS."]

"Mountain" Wheel Arrangement.

Wheel arrangement of a "Mountain" locomotive is 4-8-2. See Diagram of Locomotive Wheel Arrangements, page 40, "Railway Year Book, 1918."

[Reply to SIDNEY V. BAKER.]

"Railway Kings."

George Hudson, the English "Railway King," died in 1871, and William H. Vanderbilt, the American "Railway King," died in New York, 1885.

[Reply to K. N.]

Second Class.

You are incorrect. Second class was abolished on the Midland Railway, January 1st, 1875.

[Reply to B. THOMPSON.]

Superheater Dampers.

Great Western Railway Locomotive Engineer is not now fitting superheater dampers to the Company's locomotives.

[Reply to R. G. JAMES.]

The "Weir" Pump.

You will find particulars of the Weir feed-water heater and pump on pages 340 and 341, "Railway Year Book, 1918."

[Reply to C. T. WOOD.]

Margaretting Platform, G.E.R.

This platform has been provided for the use of workers travelling to and from Chelmsford.

[Reply to G. CHRISTY.]

Mr. Ivatt's 4-4-2 Engines.

There are 116 of Mr. Ivatt's 4-4-2 Atlantic type engines, all of which are in use on the Great Northern Railway.

[Reply to N. D.]

Digitized by Google

Carriage-Paid Goods Traffic.

MR. L. C. WEBBER REED, Great Western Railway, Carmarthen, writes: My scheme as published in the RAILWAY MAGAZINE, May, 1918, is attracting widespread interest, its potential economies having arrested the attention and enlisted the activities of railway officials throughout the kingdom, from whom I have received a large number of appreciative letters. The majority are eulogies rather than criticisms, indicating that the views are thoroughly in accord with those of my fellow railway officials, writing after mature consideration. Since I initiated the subject in 1915 they have been asked to report specially on it.

As in some cases a misunderstanding is apparent, I wish to make the scheme perfectly clear—

1. At the forwarding station the accounting and abstracting in respect of the forwarded traffic would remain precisely as at present.

2. At the receiving stations invoices received would not be abstracted. Consequently the abstracting throughout the railways would be halved.

3. All traffic "carriage paid."

I am not concerned in, neither do I attempt to criticise, any other activities of the audit offices, of which I have a keen appreciation. It is, however, to be regretted that attempted reforms should be deemed, as stated, "a censure upon the directorates," and as a consequence discouraged and received officially with undisguised prejudice. "Thus our railways have been starved of available talent."

I wish to express to the correspondents my appreciation of their helpful comments, with which I deal under three headings.

I.—Audit Accounting.

It is said that objections from a railway and public view have proved too strong for the adoption of my scheme, and it is arrogantly concluded that it has been slaughtered. True it is that it has received the customary Audit Office stab, but that is not always fatal. My "Label Only" Parcel Reform Scheme of 1905 survived it, and released parcels accounting from their stranglehold by the abolition of the Audit Office activities exactly as I now propose for Goods Accounting.

The figures given us for one of the heavy companies for the year 1916, possibly one-fifteenth of the whole, although irrelevant, are interesting and incidentally helpful. It must be distinctly understood that they apply to all Forwarded Goods Summaries as at present rendered by that company, i.e., "Paid" on, "Paid," and "To Pay." They reveal that 552,358 Local and Railway Clearing House Inaccuracy sheets were issued, resulting in over 400,000 futilities and 50,706 debit notes, with a paper debit of £36,000—85 per cent. probably reclaimed, principally from "Excess," the remainder cleared by credit note, or carried to outstandings as a contentious item, to be wiped off after prolonged correspondence—costing a considerable sum in clerical labour—by special arrangement with the Goods Manager and Audit Office.

Is there any conception of the wicked waste of time at the stations in dealing with over 6,000,000 futile inaccuracy sheets? On an average each sheet would pass to and from the Audit Office to each station two or three times, occupying the time of thousands of the staff thousands of hours, with absolutely barren results. What betterment would the companies not derive if this wasted energy of the experienced staff was concentrated on matters conserving the revenue?

As concerning my scheme, what alone is material is the number of inaccuracy sheets issued and the number and amount of debit notes issued in respect of "Paid" traffic for one year, with the resultant augmentation of the revenue. I challenge the audit offices to refute the statement that their system of check is more costly than it is worth, and venture on the assertion that at an efficiently conducted depot or station a debit note in respect of forwarded "Paid" traffic is somewhat a rarity.

My contention is based on the fact that the Audit Office would simply deal with the "Paid" debits created at the stations as represented by the abstract totals, which are agreed with the despatch book. And it is transparently clear that the record, balanced, if I may coin a phrase, on interlocking accounting principles must be absolutely accurate.

II.—Station Accounting.

As far as the stations are concerned, the simplification and office relief I claim are not contested. Evidently they are generally accepted as automatic. No scheme will, however, ensure automatic honesty. At the large stations and depots, *i.e.*, where the work is departmentalised and the bulk of the revenue is derived, frauds are admittedly almost impossible, except through wholesale collusion. If we are to be perturbed by imaginary happenings at small stations there is no limit to the distrust it would engender.

I can only repeat that in any accounting system, however protected, we have to rely in great measure on the integrity of the staff, which is generally of a high order. The suppression of "Paid" invoices, to which I have previously referred, is only just as possible, under my scheme, as it is to-day. I have enumerated the many subsidiary checks likely to counter it, and it should be remembered that the travelling audit clerks would be concentrating their attention on the greatly simplified station accounting, supplied with selected extracts of invoices, recorded at re-

Digitized by Google

ceiving stations, and other checks arising from traffic eventualities which provide the desirable moral restraint. A live audit of the things that really matter. A contrast to their present wasteful activities in verifying figures of the balanced accounts rendered by the stations to the audit offices several months previously.

At receiving stations each invoice would be recorded, as now, and summarised in the arrival book, so that the facilities for dealing with correspondence, tracing, certifying and noting overcharges and undercharges, and other requirements, would be maintained. The comparative returns at the forwarding stations would give particulars of the whole traffic and revenue, which is sufficient.

The returned empties traffic is said to be a formidable difficulty, and we are reminded that the essence of accountancy is concentration. Two thousand firms and the brewery companies, by special arrangement with the railway companies, have their returned empties sent carriage "To Pay," and it is claimed for this arrangement, although it entails a large amount of clerical work for what is admittedly an unremunerative traffic, that it obviously does concentrate accounts. All charges on those for each firm being placed to one account and paid by one firm. If it were abolished we are asked to imagine the huge aggregate amount of work that would be entailed in collecting charges from the thousands of senders of empties, for which the freight very often amounts to a few coppers per consignment. I concede this would be prodigious.

The 2,000 firms and the brewery companies are, generally speaking, large freighters. Their traffic is mostly charged at computed weights, so also are returned empties; all are branded with the owners' name. My proposal is *to increase the forwarding computed weights to cover the carriage cost of the returned empties,* which would be consigned and invoiced "Return Empty—Carriage Paid," one account thus sufficing for the *two services,* an immense saving of clerical labour.

III. Everything Paid.

The enacting that all rail-borne goods should be "Carriage Paid" is admittedly a wide controversial subject. A close study of the question, however, cannot fail to illuminate its advantages.

It would no doubt enormously simplify matters if it were made a condition that all goods traffic should be "Carriage Paid." Having regard to the practice in all other businesses it does not seem an unreasonable arrangement that all persons who require work to be done, or, in other words, who make a contract with the company, should also pay the company for its services under that contract.

The simplification arising from the contract and the debit being at the *one* (sending) station and the consignor in all cases responsible for the charges, is a most important aspect, and cannot be too strongly emphasised. It is indeed difficult to realise the immense relief that "Everything Paid" would mean at the stations.

The quickening of delivery would go far to remove the congestion at the goods depots, and consequently expedite release of railway wagons, a very important consideration in these days. Consignees generally would naturally prefer their consignments "Carriage Paid."

The fruit and vegetable commission agents are suggested as being objectors. It is not apparent why they should be except that they have an undue preponderating interest in the large number of deductions they claim, which would be simplified, if not reduced, if made at the forwarding station, and should it lead to more direct trading between the producer and the actual vendor or consumer would not adversely affect the railway companies.

Another class of agents, the firms referred to who send buyers to the different towns, could be accommodated with credit accounts to be dealt with by ledger transfer to their "Home" station. An easy and inexpensive process, as only one account is prepared. The forwarding station would do the necessary work with corresponding relief at the receiving station.

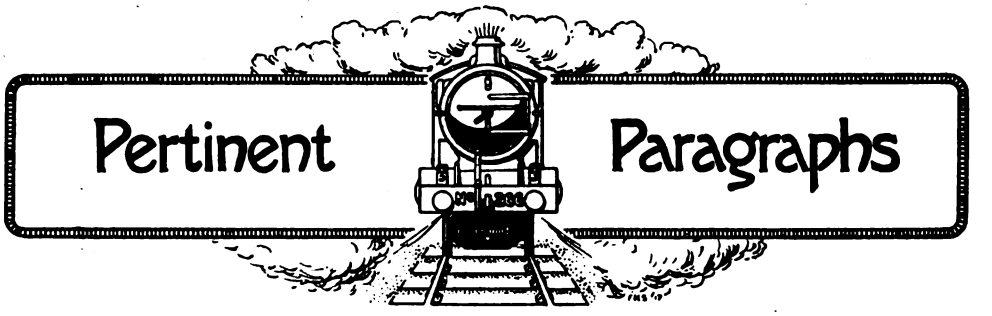
The preferential plea advanced on behalf of the commission agents that for very obvious reasons they do not desire, as middlemen, to divulge the original sender or ultimate consignee, is a personal matter entirely outside the scope of the public interests to be served by the railway companies as common carriers.

The competition of water and motor carriers, which, it is feared, will become more formidable, is mentioned as the most important factor of all. In my opinion, it is a myth. The "Everything Paid" principle would evidently confer on them the same benefits and economies accruing to the railway companies which they must appreciate. They will not fail to apply the object lessons that have been demonstrated by senseless railway competition. Moreover, the general public will be found to be indifferent in the matter, as the pros and cons—receivers to-day, senders to-morrow—affect them so equally.

The success of the innovation of the prepayment of all parcels, miscellaneous and fish traffic, to which similar objections were made, supports in view that the difficulties raised are more imaginary than real.

We must clear our minds of prejudice when considering the removal of old-time methods that hamper railway transport, which, as has been said, is one of the main arteries of our national life.

Digitized by Google



Abolition of the Second Class.

WHEN, on October 7th, 1874, the Midland Railway announced that on and after January 1st, 1875, second-class bookings would be abolished, the action was generally regarded as a daring innovation. In *The Times* there appeared the following comment:—"It is stated that the railways most directly affected by the policy of the Midland in abolishing second-class carriages have decided to adopt a retaliatory policy. They do not intend to abolish any one of the three classes, but to lower second-class fares below Midland firsts, and to run first-class trains to all competing points against the Midland. Whatever its financial soundness—and we should question it gravely—an attempt to coerce the Midland after this fashion is, to say the least, somewhat petty, and cannot be regarded as a specimen of sagacious administration."

The foregoing quotation makes strange reading to-day when British railways, one after the other, have followed the Midland example.

The London and South-Western Railway is the latest convert to the abolition of second-class travel. From Monday, July 22nd, no second-class bookings on this line have been made. The step has been dictated by war conditions, although the decrease in second-class long-distance travel to about 2 per cent. of the traffic has for some time made the change advisable. Saving of coal, resulting from the avoidance of hauling so much only partially filled heavy main line stock is one of the prime motives of the elimination, but the alteration will permit quite a number of other economical working arrangements to be carried out. Uniformity of accommodation throughout the line will also be secured, thereby avoiding a certain amount of confusion from the fact that for some time over the electrified suburban area and country branches and in the through trains from other systems, first and third-class accommodation only has been provided. Holders of second-class season tickets expiring after July 21st have been given the option of exchanging to first class by a proportionate payment, or if they prefer to travel third a pro rata allowance is made. The existing second-class stock is to be converted to third class as soon as possible, but until the alteration is made second-class carriages are now available for third-class passengers.

No surprise was expressed when the London and South-Western Railway made the announcement of the change. The question of stopping second-class travel had been raised at more than one meeting of the shareholders, and it is noteworthy that only first and third-class rolling stock were provided when electrical services were brought into use. The South Eastern and Chatham Railway is the only large system in Great Britain retaining the second class for main line, suburban and Continental traffic. As RAILWAY MAGAZINE readers are aware, the Great Eastern and the London, Brighton and South Coast Railways have maintained second-class bookings for Continental trains, while the Great Eastern and Great Northern lines still retain second-class fares and carriages for their suburban services.

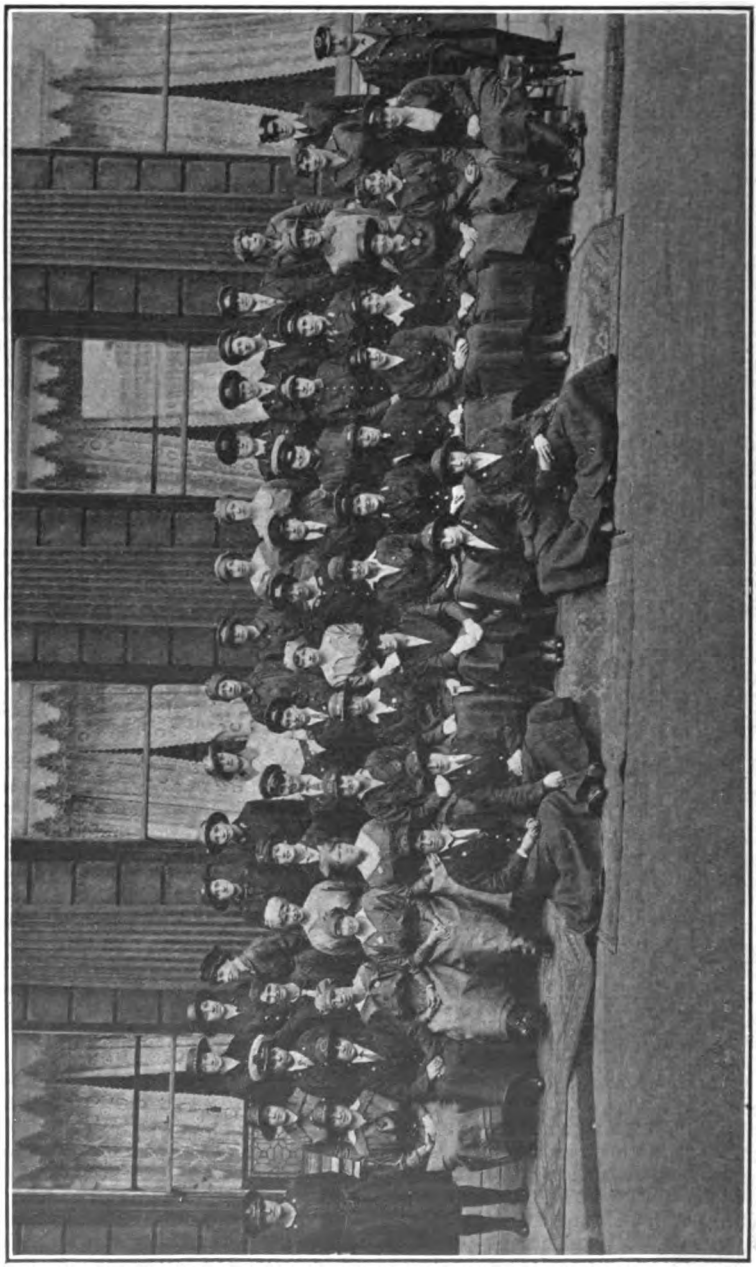
Railway Women Workers at Buckingham Palace.

ON more than one occasion attention has been directed in the RAILWAY MAGAZINE to the excellent service now being rendered on our railways by women workers, and from time to time illustrations have been inserted depicting them engaged in various duties.

Royal recognition has now been given the women who have come forward in order to release railwaymen for service with the colours, for fifty of them were selected for participation in the recent procession of homage to their Majesties the King and the Queen.

To Major Watson, the Assistant General Manager of the Lancashire and Yorkshire Railway, must be given the credit of bringing to the notice of the Ministry of Labour the claims of the women railway workers. To Mr. C. F. Graseman, London and North Western Railway, the Railway Executive Committee entrusted the arrangement of all details, and, needless to say, the function was an unqualified success. A finer body of women it would have been difficult to get together. Miss Stoddart, of the clerical staff of the London and North Western Railway, represented the contingent, and was presented to their Majesties, and Miss Page,

Digitized by Google



Photo] RAILWAY WOMEN WORKERS WHO TOOK PART IN THE BUCKINGHAM PALACE PROCESSION. [*Topical.*

Digitized by Google

Photo] TYPES OF RAILWAY WOMEN WORKERS. [*Topical.*

From Left to Right.

1, Porter. 2, Ticket Collector. 3, Ticket Inspector. 4, Munition Worker. 5, Policewoman. 6, Engine Cleaner. 7, Van Driver. 8, Electrician. 9, Ticket Collector. 10, Goods Porter, 11, Ticket Collector.

Digitized by Google

of the Great Eastern Railway, was leader in the procession. A photograph of the railway representatives who took part in the procession appears on page 132.

The Trans-Australia Railway.

CRYSTALLIZED in a folder issued by the Commonwealth Railways Commissioner, there is a wealth of information concerning the east and west trans-Australian Railway from Kalgoorlie to Port Augusta, which was opened last year.

The folder includes a map showing the route of the line and its connections with the capitals of all the Australian States. The time-table given indicates the train service between the Indian and Pacific Oceans from Fremantle at one end to Brisbane on the other, a distance by rail of 3,485 miles. The train journey involves a break of gauge at five points, the predominating gauge being the 4 ft. 8½ in., on which are laid 1,941 miles altogether out of the 3,485. With present timings a passenger leaving Perth (Western Australia) on Mondays and Wednesdays at 5 p.m. reaches Brisbane (Queensland), a journey of 3,472 miles, at 6.40 p.m. on Sundays and Wednesdays. On the return journey leaving Brisbane at 8.5 a.m. on Saturdays and Mondays he is due at Perth 9.45 a.m. Fridays and Sundays. On the trans-Continental line itself the journey of 1,051 miles occupies 37 hours, including stops, and after allowing for the two hours difference in time en route. Excluding stops the journey over the new line takes about 34 hours. Eventually it should be practicable to make the journey between Port Augusta and Kalgoorlie in about 24 hours, being an average speed of 44 m.p.h. The folder gives an excellent description of the country traversed by the new line, and illustrates the comfortable rolling-stock used on it, including dining cars, first and second-class sleeping cars, etc.

Under the title "Long-Distance Travelling in Australia," an illustrated article descriptive of the opening of the line appeared in the RAILWAY MAGAZINE, March, 1918. The contributor included therein a quantity of data concerning the new line, kindly supplied by Mr. W. A. Watt, Minister of Works and Railways, Commonwealth of Australia.

The "Robinson" Locomotive Superheater.

THERE has just been issued by the Superheater Corporation, Ltd., 14, New Burlington Street, London, W.1, what is modestly described as "a new booklet," but on examination is found to be a handsome work of 60 pages (11¼ in. by 8¾ in.), full of excellent locomotive and other illustrations, accompanied by explanatory letterpress.

It is pointed out that apart from the altruistic considerations, the prevailing high price of fuel, whether coal or oil, a price that is not likely to be reduced very much in the future, is such as to justify considerably more capital expenditure on fuel-saving appliances than would be the case if supplies of cheap fuel were obtainable.

As it was found advantageous to fit a reliable smoke-tube superheater to locomotives when the prices of fuel were low, it is obvious that the advantages to be gained today by fitting superheaters are greater than ever. It has been proved that the "Robinson" high temperature smoke-tube superheater is in every way absolutely reliable in service, and the results obtained from its use have given every satisfaction. Simplicity, strength, durability, and reliability, combined with thermal efficiency, have been the guiding factors in its design, and the results obtained have been so satisfactory that the superheater is now at work successfully on locomotives on most of the principal British, Colonial, and foreign railways.

The Superheater Corporation, Ltd., will be pleased to forward a copy of their brochure to locomotive engineers and others interested in the question of locomotive superheating.

Mr. Aslett's "au revoir."

THERE was a large gathering of railwaymen at Barrow-in-Furness, when Mr. Alfred Aslett, J.P., was presented with a silver tray and silver tea and coffee service by the directors, staff, and workpeople on his retirement from the posts of Secretary and General Manager of the Furness Railway. The service was of most exquisite design by Paul Storr, the famous London silversmith in 1770.

The chair was occupied by Mr. F. J. Ramsden, who was accompanied by Mr. A. Aslett, Mr. L. Speakman, Mr. G. Linton, and Mr. H. Curson. Mr. Linton, at the outset, read letters or telegrams of apology from Lord Richard Cavendish, Mr. G. Mure Ritchie, Colonel Jackson, Mr. Myles Kennedy, Mr. William Burnyeat, Sir John Randles, M.P., Mr. W. F. Pettigrew, Mr. R. F. Miller, Mr. William Brockelbank, and many others.

The Chairman said that in 1895 Mr. Aslett was appointed as General Manager of the Furness Railway. At that time the directors wanted a new manager who would develop the passenger business. The way in which Mr. Aslett had developed it was remarkable. He introduced the cheap day fares, the circular tours and the 20 tours in Lakeland, tours which to the end of time would be associated with his name. There was also the great spurt given to advertising the line, and the developing of the Fleetwood steamers, which brought quite new business to the company and opened up to them a new district in South Lancashire, which they had never before been able to reach. In the 23 years in which Mr. Aslett had been General Manager, the passenger side of the line had gone on apace, and had it not been

Digitized by Google

for the war that development would have been further extended. He hoped Mr. Aslett would live long to enjoy a good well-earned holiday. He had given his best and had got others to give their best to the service of the Company.

Mr. Jamieson also spoke on behalf of the craftsmen of the company.

Mr. Alfred Aslett feelingly expressed his gratitude to the subscribers to the presentation, and to the Chairman for the kind words spoken on this occasion. It was hardly necessary for him to say how very much he regretted leaving the Furness Railway, in which for about 23 years many happy and interesting days had been spent, although some of them had necessarily been attended with anxiety. The days were never too long in closely watching and safeguarding the interests of the company. Mr. Aslett referred to the very large number of letters that had reached him since his resignation was announced, including letters from the Duke of Devonshire, formerly Chairman of the Furness Railway, and now Governor-General of Canada, and from Sir James McKechnie, director of Vickers, Ltd. Mr. Aslett alluded to the wonderful development of the oil importation at the Barrow Docks in the last 20 years, and expressed the hope that after the war the passenger traffic would again be a prominent feature in the company's business. In 1913 the number of passengers, including workmen, was 4,788,000, compared with 2,370,000 in 1895, an increase of 102 per cent., representing probably a dividend of 1⅓ per cent. on the ordinary stock. In conclusion, he wished them all "au revoir,"

MR. ALFRED ASLETT, J.P.

Digitized by Google

associating Mrs. Aslett with his appreciation of their kindness.

In connection with Mr. Aslett's retirement, there has been recalled the splendid testimonial of his good work volunteered by the eighth Duke of Devonshire at the annual dinner of the Railway Benevolent Institution in London in the year 1900. His Grace remarked that if the Railway Benevolent Institution received the same help and encouragement which Mr. Aslett so fully gave the Furness Railway they would have every reason to be proud. A Lancashire journalist states that the late Sir John Hibbert, when deputy chairman of the Furness Railway, expressed to him one day at Hampsfield that Mr. Aslett was a wonderful railway manager. He was so fully alive to his company's interests, so full of energy and vitality, that he questioned whether a better manager could be found.

RAILWAY MAGAZINE readers will join with Mr. Aslett's many friends in wishing him good health and happiness in the rest and repose of his retirement.

British Railwaymen in France.

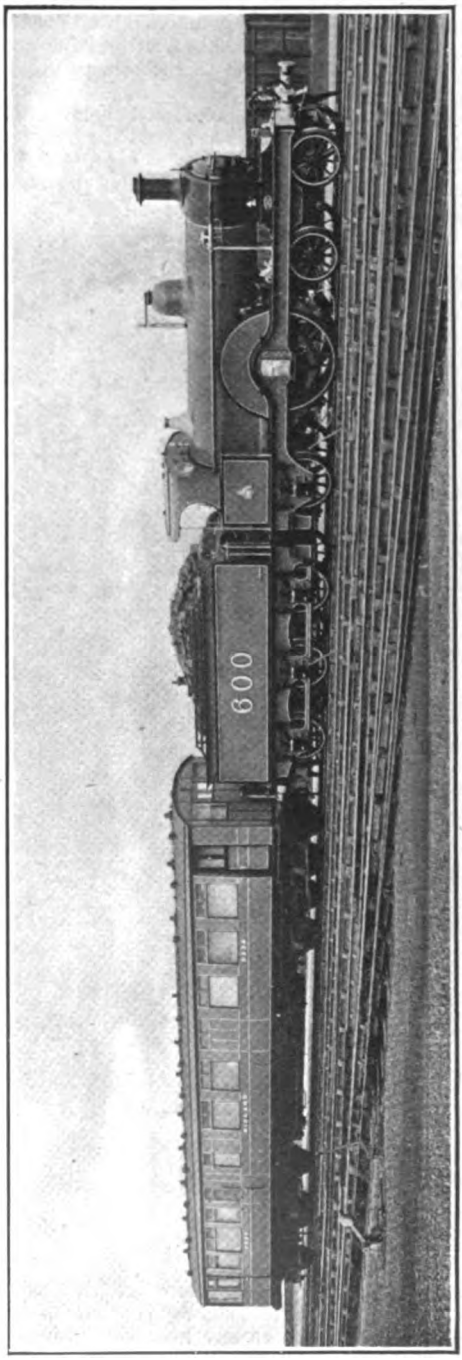
IN the RAILWAY MAGAZINE from time to time since the outbreak of war reference has been made to the large number of British railwaymen serving in the Army, particularly in France. In season and out of season we have impressed upon our readers the desirability of supporting us in our efforts to keep the railwaymen in military service overseas supplied with the literature of their calling.

While many RAILWAY MAGAZINE readers have gladly co-operated with us by handing their old magazines over the counter at a post office for forwarding to the troops, much more could be done in this direction, for the Camps Library is badly in need of more copies of the RAILWAY MAGAZINE.

Of the many letters recently received showing how much this periodical is appreciated by the military overseas, we will quote but one, in the earnest hope that it may encourage our readers in the homeland not to weary in well-doing nor to slacken in any way the continuance of the supply of railway literature, particularly to the railway troops on active service.

The communication alluded to is from 2nd Lieut. A. L. Stead, R.E., who writes:—

"I feel it may interest you to know how greatly the RAILWAY MAGAZINE is appreciated out here by all ranks of the railway troops, both on the broad gauge and on light railways. An old admirer and occasional contributor to your publication myself, I look forward now more than ever I did to its arrival month by month. My copy eventually finds its way round the district, and I know of no other publication which is so much sought after.



MIDLAND RAILWAY OFFICIAL SALOON WITH SINGLE DRIVING EXPRESS LOCOMOTIVE AS ONE UNIT.

"What really prompts me to drop you this note of appreciation is the fact that I have just returned from a tour of the light railways in this district, and in almost every control

Digitized by Google

post and hut on the system there was at least one of the coloured plates of locomotives taken from the RAILWAY MAGAZINE pasted on the wall. In more than one instance, also, a very tattered copy of the magazine itself lay in the building.

"Railwaymen in the army are just as keen as their comrades at home to know all that is going on in the railway world, and over the pages of the RAILWAY MAGAZINE there is much talk of 'shop.'

"The whole of the light railway troops—most of them drawn from the railways of the United Kingdom—would sadly miss the RAILWAY MAGAZINE if by any ill-fortune it was to cease publication."

Standardised Season Ticket Regulations.

AN important effect of the recent Board of Trade order is the establishment of uniform conditions in regard to the issue and renewal of season tickets upon all railways under Government control. The new features are the association of the applicant's National Registration Card with the application; the requirement to state the period of residence at the address given; the applicant's occupation, nature of business and business address; particulars of season ticket previously held and the reason the ticket is required if not for business purposes. Bearing in mind all that has transpired recently in regard to season tickets the object of these questions is clear. It is provided by the regulations that season tickets shall be issued subject to the railway bye-laws and regulations, etc., including alterations in the number and times fixed for the starting or arrival of trains or steamboats. The railway concerned is not to be held liable for any consequence arising from alteration of times, nor for want of accommodation in trains or steamboats, nor for delay in starting or arrival. The same rule applies to the discontinuance of the running of any trains or steamboats, whether permanently or otherwise. A season ticket is not transferable, and if transferred will be forfeited, and the persons party to any transfer will be liable to prosecution. An "express condition" is that a season ticket is not available for any journey unless it is produced on demand, and if not produced the holder of the ticket shall be deemed not to have paid the fare for the particular journey and the fare shall be recoverable from the person concerned. Notice must be given if a ticket is lost, and should a duplicate be issued a charge may be made.

On its expiration a season ticket must be surrendered. If not surrendered it will not be renewed from any other date, and should an interval occur between the expiration of a ticket and the date on which the new ticket is taken up no application for refund of fares paid in the interim will be entertained.

A season ticket holder who travels in a class of carriage superior to that for which the ticket was issued must pay the difference between the ordinary single fares for the respective classes. A season ticket holder is not entitled to priority of place over other passengers, and no undertaking is given as to conveyance in any particular train or class of carriage, and if a train not provided with the class of accommodation covered by the ticket is used the difference in fare will not be refunded.

A railway may decline to issue or renew a season ticket; a ticket is liable to forfeiture for breach of the regulations; and acceptance of a season ticket is held to constitute acceptance of the regulations and conditions.

No refund for the unexpired value of a surrendered season ticket will be made except in the case of the death of the holder; his having joined His Majesty's Forces or entered His Majesty's service; or a person in the service of His Majesty who is obliged to change his residence by reason of such service. Surrender value payment in any case is limited to periods of more than a month. No refund or extension of time will be made where a season ticket is surrendered for a temporary period.

Many of the regulations above mentioned have long been in force, but in the light of numerous recent prosecutions it would seem that their recapitulation may have its uses.

Digitized by Google

It is with great regret we record the death of Mr. Peter Drummond, Locomotive Superintendent, Glasgow and South Western Railway. Mr. Drummond, who was a native of Ayrshire, served his apprenticeship with Forrest and Moor, engineers, Glasgow, and later joined the locomotive department of the London, Brighton and South Coast Railway under Mr. William Stroudley, remaining there from 1870 till 1875, when he returned to Glasgow and joined the North British Railway at Cowlairs Locomotive Works. In 1882 he became connected with the Caledonian Railway, and eventually became Assistant Locomotive Engineer and Works Manager at St. Rollox Works, Glasgow. In 1896 he was appointed Locomotive Superintendent of the Highland Railway, and there he designed the powerful "Castle" class of 4-6-0 locomotives and an improved class of 4-4-0 express passenger locomotives to meet the heavy requirements of the line. Mr. Drummond transferred his services to the Glasgow and South Western Railway in 1912. When he was on the Glasgow and South Western he produced successively 4-6-0 and 4-4-0 passenger locomotives, and a large 0-6-0 class of goods engine, in addition to tank engines. He came of a distinguished engineering family. His brother, the late Mr. Dugald Drummond, who died in 1912, was for 17 years Chief Mechanical Engineer of the London and South Western Railway.

Photo] [*Lafayette.*

THE LATE MR. PETER DRUMMOND,
Locomotive Superintendent,
Glasgow and South Western Railway.

* * *

Mr. James M'Laren, head of the Conveyancing Department in the Solicitor's Office of the North British Railway, has been appointed Secretary, in place of Mr. John Cathles, who retires shortly under the age limit. Mr. M'Laren is a native of Kirriemuir, and is a qualified law agent. Mr. Cathles has been in the service since 1871, and he was appointed Secretary in 1892.

* * *

Mr. Henry John Burcham, who has been called upon by the directors of the London and North Western Railway to fill the vacancy occasioned by the death of the Rating Agent, Mr. W. C. Neate, was born on December 13th, 1871. Educated at the Lower School of John Lyon, Harrow, he entered the service of the London and North Western Railway in March, 1888. After serving for a few months in the Audit Department, he was, in November of that year, transferred to the Rating Department, then under the control of Mr. S. M. Howard. During his association with that Department he also served under Mr. Parker, occupying the position of Outdoor Assistant, and under the late Mr. Neate, as General Assistant, until January of this year, when, in consequence of his chief's serious illness, he was made Assistant Acting Agent.

* * *

At the recent Goods Managers' Conference, held at the Railway Clearing House, Mr. J. Smeal (London and South Western Railway) was elected Chairman for the year 1919.

* * *

At the July meeting of the Railway Clearing House Superintendents' Conference, Mr. Chas. Aldington, C.B.E. (Great Western

Digitized by Google

Railway), was elected Chairman until the end of 1919.

* * *

MR. A. W. BOLDEN, having been elected on the Board of the Antofagasta (Chili) and Bolivia Railway, has been appointed Managing Director; he will in future take the title of Managing Director and Secretary instead of London Manager and Secretary as hitherto.

* * *

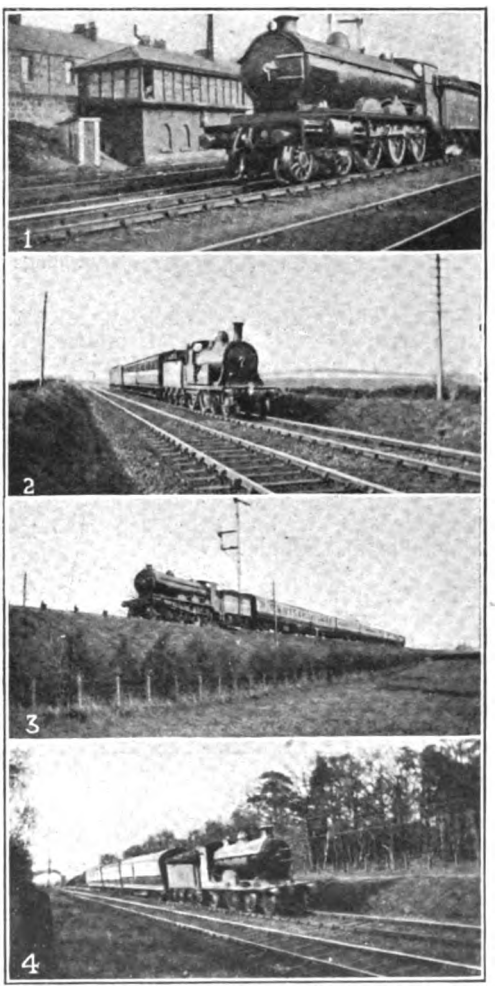
A COUNTRY ramble to Potters Bar will be undertaken by the Railway Club on Saturday, August 17th. Members will meet at King's Cross local booking office at 2 p.m. for the 2.30 p.m. train. At the club premises, 92, Victoria Street, London, S.W., Mr. G. W. J. Potter will, on Tuesday evening, September 10th, lecture on "The Ongar Branch of the Great Eastern Railway," and on Tuesday evening, October 8th, Mr. E. W. C. Kearney will attend, and his subject will be "The Kearney High Speed Railway."

* * *

AN interesting railway action recently came before Mr. Justice Darling and a special jury arising out of an accident at Oxford Circus Station on January 30th, 1918. The plaintiff, Mr. Towse, who was a consulting engineer, was trying to board a Tube train at Oxford Circus when he was thrown on to the platform and injured. According to his evidence, the train was stationary, and the conductor in closing the gates pushed him off and started the train. The defence was that Mr. Towse ran after the train, which was already in motion, and in trying to board it stumbled and fell. Plaintiff's counsel told the jury that the plaintiff brought the action as a protest against the methods of conductors on the Underground railways in their treatment of the public at large, and not with a view to obtaining damages. The Judge, in summing up, warned the jury to confine their attentions to the evidence in the case and not to consider their own experiences. The jury found for the railway company, and judgment was entered accordingly.

* * *

THIRTY members of the Institution of Locomotive Engineers (Northern Centre) recently visited the locomotive shops of the North Eastern Railway at Darlington. They were received at the works manager's office by Mr. A. C. Stamer, Acting Chief Mechanical Engineer, and Mr. Norman Lockyer, Works Manager. A photograph of the gathering was taken outside the offices, and the party then divided into two groups, one group taking the tour of the works via the new boiler shop at Stooperdale, the other group starting from the North Road works. No pains had been spared to ensure the visit being a success, and the result was that each individual had a most instructive and enjoyable time. After touring for four hours through the extended works, the party foregathered in the new general offices. Each member proceeded to partake of the excellent tea which had been made ready for them by Mr. Stamer's hospitality. RAILWAY MAGAZINE readers will remember that "The Building of a Locomotive Boiler" at Stooperdale formed the subject of a profusely illustrated article by Mr. Chas. S. Lake, M.Inst.C.E., in our issue for December, 1917.

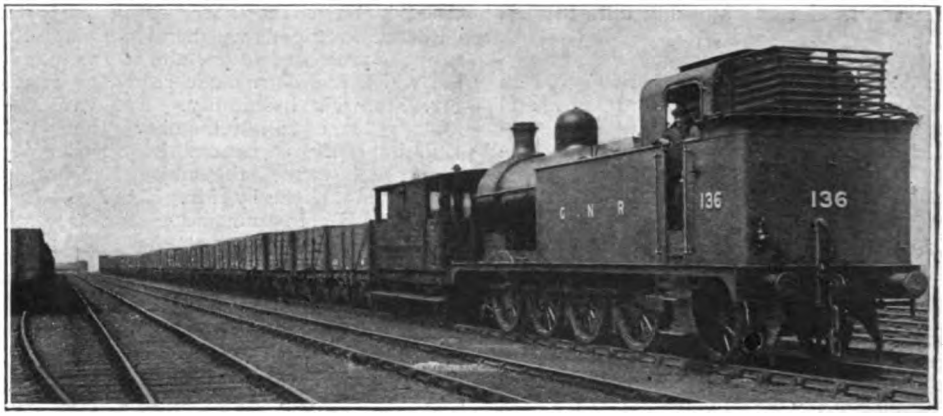


Photos] [*Ian Dundas Orr.*

CALEDONIAN RAILWAY.

(1) One of Mr. Pickersgill's new express engines, No. 60, leaving Larbert on Aberdeen express.
(2) Stirling to Glasgow express.
(3) Glasgow (Buchanan Street) to Perth and Aberdeen express approaching Alloa Junction.
(4) The Postal, Limited, Aberdeen to London, between Stirling and Larbert.

Digitized by Google



Photo] [*Chas. S. Lake.*

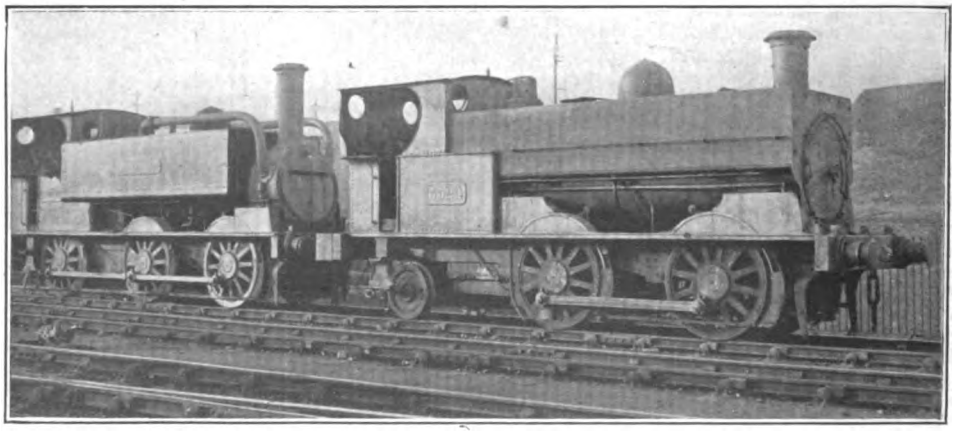
GREAT NORTHERN RAILWAY.

Recently superheated 0-8-2 tank locomotive, No. 136.
Photographed just as it had brought a train from the coal mines on to the Gravitation Sidings at Colwick.

FROM a military camp in Surrey, Mr. K. Paton writes:—"It may be of interest to your readers to know that the London and South Western Railway is adopting a slightly revised colour scheme for its engines. Instead of the brown edgings, with black and white lines, locomotives are now being trimmed out in dull green. The effect of the new livery is not at all displeasing, and I have seen, amongst other engines, Nos. 443 and 446 painted in this fashion."

* * *

MR. C. WILLIAMS, our one-time Crewe correspondent, although now serving in the Army, is still much alive in regard to locomotive matters. From a north country camp he communicates:—I understand that several more London and North Western Railway 4-4-0 "Precursor" class locomotives are being superheated. These include Nos. 469, *Marmion;* 802, *Gaelic;* 1363, *Brindley;* and 2064, *Jason.* In some cases the engines will be provided with extended smokeboxes, including No. 1363, but No. 469 will retain the original short smokebox. Nos. 1043 and 1883, 4-cylinder compound mineral engines, have been converted to 2-cylinder simples, and provided with superheaters. The latest superheater goods engines turned out at Crewe are:—Nos. 1129 and 1614 (27 shed), 2297 and 2343 (8 shed), and 2376 (25 shed). Nos. 1345, *James Bishop,* and 2431 ("Claughton" class) have been transferred, the former from Crewe to Carlisle, and the latter from Preston to Crewe.



Photo] [*P. F. Cooke.*

LONDON AND NORTH WESTERN RAILWAY.

0-4-2 Bissel truck saddle tank engine, No. 3524, and 0-6-0 tank engine, No. 3021, *Liverpool.*

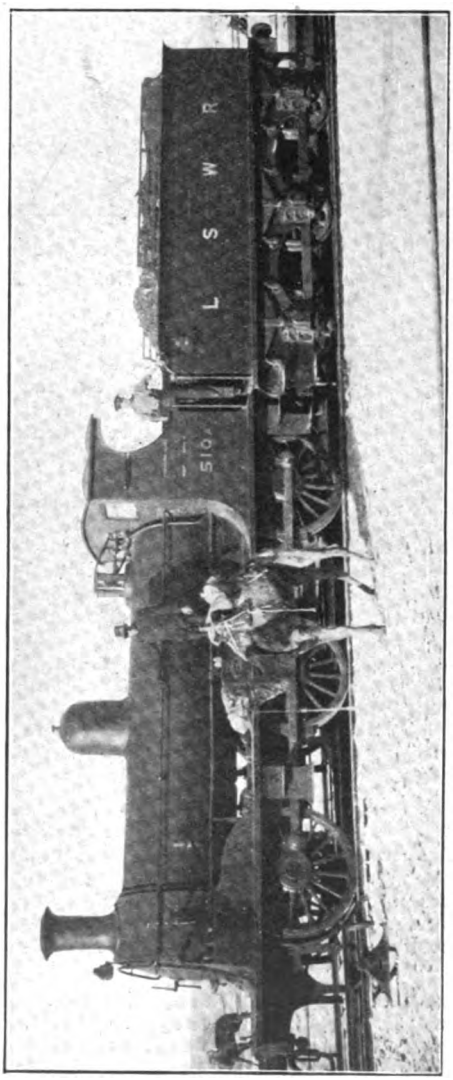
Digitized by Google

In reading Mr. Ahron's article on the early engines of the Caledonian Railway, writes Mr. A. Dunbar, I noticed a remark to the effect that some of the "Oban Bogies" (Brittain's 4-4-0 engines of 1882 for the Oban line) were still running. I may state that I saw one recently at Forfar on a local train, but, unfortunately, omitted to take the number. I may also add that when at Polmadie recently I saw one of Drummond's rebuilt 6 ft. 2 in. goods engines, numbered 1479. These were the 2-4-0 goods engines used for passenger service till his 4-4-0 engines of 1884 came out. Another item of news is that three new superheated goods engines have made their appearance on the N.B.R. They are of the usual 0-6-0 type, and have been built at the Atlas Works of the North British Locomotive Company. They are numbered 88, 89, and 123. The first two take the numbers of the 0-4-4 tank engines, while No. 123 takes that of a small 0-6-0 tank. The 0-6-0 tank originally numbered 123 has had its number altered to 1328.

* * *

From Mr. David L. Thomson comes some interesting Scottish locomotive news. "Few railways," he writes, "have been more affected by war-time working than the Highland, and as the large increase of traffic on this line is not likely to be wholly permanent after the war, some extensive borrowing has been done. On Highland metals may be seen locomotives of the Caledonian, G.N. of S., N.B., N.E., L. and S.W., L.B. and S.C. Railways, together with a motor coach belonging to the L. and N.W.R. New locomotives have also been acquired, the latest arrivals being Nos. 75-78, inclusive, of the 4-6-0 type built by Messrs. Hawthorn, Leslie and Co., Ltd., and said to resemble the previous series constructed by the same firm for the Highland Railway, and subsequently sold to the Caledonian authorities. The weight of the latter, by the way, is 71 tons, of which 51 tons are adhesive, and 110 tons complete in working order with tender, while their working pressure is 160 lb. per sq. in.; these details have not previously been published. These engines, which are great favourites with their drivers, are employed principally on double-trip express goods working between Glasgow and Perth and Carlisle. Thirty-four Caledonian engines, including the six of this series, are now equipped with 'pop' safety valves. Among other Caledonian news, it may be mentioned that as the McIntosh 4-4-0 engines come into the shops for general repairs, the wing plates on either side of the smokebox are removed, greatly altering their typical appearance at the front end, and bringing them into line in this respect with the new Pickersgill superheater 4-4-0's. Nos. 150, 722, 887, and 888, of Perth shed, have been so treated."

Mr. J. Macartney Robbins, with whose excellent railway photographs Railway Magazine readers are familiar, has just returned from Ireland. He writes concerning Midland Great Western Railway locomotives as follows:—"There are three engines of the 'Mercuric' class rebuilt—124, *Mercuric;* 125, *Britannic;* and 129 *Celtic.*



WITH THE PALESTINE FORCES TRANSPORT METHODS, BOTH ANCIENT AND MODERN, WORK SIDE BY SIDE.

Besides those, there are three of the others—6, *Kylemore;* 7, *Connemara;* 8, *St. Patrick.* All the others are to be rebuilt as they come in for repairs. I saw the 11.0 a.m. ex Mullingar-Broadstone express with No. 7 and 24 vehicles on. There were about eight horse-boxes in rear, and various other four-wheeled vans, besides the passenger coaches."

Digitized by Google

A 19TH CENTURY LONDON AND NORTH WESTERN RAILWAY ENGINE.
No. 1008, *Rowland Hill.*

WRITING from Kirkintilloch, Mr. Albert F. Zamorski remarks that the bulk of the Caledonian passenger traffic from Glasgow to the North is falling to the "Dunalastair" 4-4-0 engines just now. They are at present shedded as follows:—Polmadie, 766*, 767, 769*, 770, 772*, 774; St. Rollox, 768, 775, 776, 777, 778, 780; Stirling, 773; Callander, 779; Perth, 771*. (* Fitted with Robinson superheater.) On page 330 of the May RAILWAY MAGAZINE I see (he continues) that the 6 ft. 4-6-0 engines 938-943 take a share in the passenger traffic on the Caledonian. All these engines are at present working goods trains. Nos. 938-941 are at work between Glasgow and Carlisle, and 942-3 between Glasgow and Perth. The new 0-6-0's work to Aberdeen, and two of them work to Carlisle and back viâ Edinburgh alternately.

* * *

THE following new 0-6-0's are out on the North British Railway:—88, 89, 123, 139, 157, and 167. The old engines bearing these numbers are now:—1326, 1327, 1328, 1329, 1331, and 1335. The following is the new classification of the North British locomotives:—

Class "A."—Reid's 0-6-2, radial tanks.
Class "B."—Reid's 0-6-0, 18½-in. cylinder.
Class "C."—Holmes' and Drummond's 0-6-0, 18-in. cylinder.
Class "D."—Holmes' and Drummond's 0-6-0, 17-in. cylinder; also, Holmes' 0-6-0 tanks, "795" class, and Nos. 502-5, 0-6-0 tanks, taken over from Bothwell and Hamilton Railway.
Class "E."—Wheatley's 0-6-0 and 0-6-0 tanks, 17-in. cylinders.
Class "F."—Holmes' 0-6-0 tank dock shunters, 15-in. cylinders.
Class "G."—Holmes' 0-4-0 tank dock shunters, 14-in. cylinders.
Class "H."—Reid's 4-4-2's.
Class "J."—Reid's "Scott" class, 4-4-0.
Class "K."—Holmes' 4-4-0, "317" class.
Class "L."—Reid's 4-4-0 "Glen" and "861" type.
Class "M."—Holmes' 4-4-0, "730" class; Holmes' 4-4-0, "575" class; Drummond's 4-4-0, "476" class; Reid's 4-4-2 tank, class "1," and 0-4-4 tanks.
Class "N."—Holmes' 4-4-0, "592," "633," and "693" types.
Class "P."—Wheatley's 4-4-0's and 2-4-0's; Drummond's 0-4-4 tanks, and 4-4-0 tank, "494" class.
Class "R."—Drummond's 4-4-0 tanks, "19" class, and 0-6-0 tanks, "20" class.

I believe that the letters for the 0-6-0, 19½-in. cylinder goods, and 4-4-2 tank, "438" class, have not been yet decided, writes Mr. Zamorski, whom the RAILWAY MAGAZINE has to thank for the foregoing information.

* * *

ON this page is illustrated London and North Western Railway 7-ft. Bloomer locomotive, No. 1008, *Rowland Hill,* designed by Mr. McConnell, and built by Kitson and Co., of Leeds, in March, 1861. The photograph was taken at Camden Shed in 1876. The well-known Camden driver of 40 years ago, "Sammy" Lovesey, is on the engine, and the original locomotive shed, or "Roundhouse," of London and Birmingham Railway is shown in the background. This engine was mentioned by Mr. Ahrons in his London and North Western Railway contribution to the RAILWAY MAGAZINE, January, 1915. The illustration is from a photograph lent by Mr. C. J. Alcock.

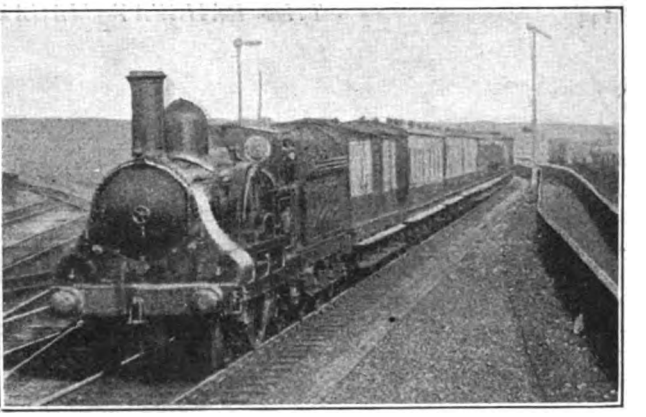
Digitized by Google

Digitized by Google

Digitized by Google

An Historic Locomotive.

The "CORNWALL," London and North Western Railway.



THE "CORNWALL" ON THE MANCHESTER-LIVERPOOL EXPRESS.

AMONG early locomotives built for service on British railways, the London and North Western Railway *Cornwall* ranks as one of the most notable from an historical standpoint, and also on account of the peculiarities attaching to the design as originally planned. The engine was built at Crewe Works in the year 1847, being completed in the month of November of that year. It was designed by the then Locomotive Superintendent of the London and North Western Railway, Francis H. Trevithick, who, in a work written later to commemorate his father,* used these words:—

"An engine was constructed in 1847 to refute a dogma of the broad gauge advocates that the narrow gauge had reached its limit of speed because the driving wheels could not be safely increased in diameter. A narrow gauge engine was constructed by the writer with 8 ft. 6 in. driving wheels, being 6 in. more than the largest broad gauge wheels. This engine still continues to run express trains, the only change being in a more modern boiler. It was sent to the London Exhibition of 1851, and some years afterwards the late Mr. Fairbairn congratulated the writer upon the medal awarded for it, and accounted for its non-presentation by the question having arisen as to whether the medal should be awarded to the railway secretary, whose name is officially attached, or to the designer, whose name was not officially attached."

The main distinguishing feature of the *Cornwall*, as originally designed and built, was its "underslung" boiler, the axle of the driving wheels passing through a clearance specially made for it at back end of the boiler barrel near the top. The exact arrangement is shown clearly in the drawing on page 147. Although successful in speed attainment—it was credited with having attained a speed of 117 m.p.h. down the Madeley Bank between Stafford and Crewe—the engine, whilst it retained this boiler was not, generally speaking, satisfactory, and in 1858 it was rebuilt at Crewe with a boiler of a more normal type, having the driving axle below it.

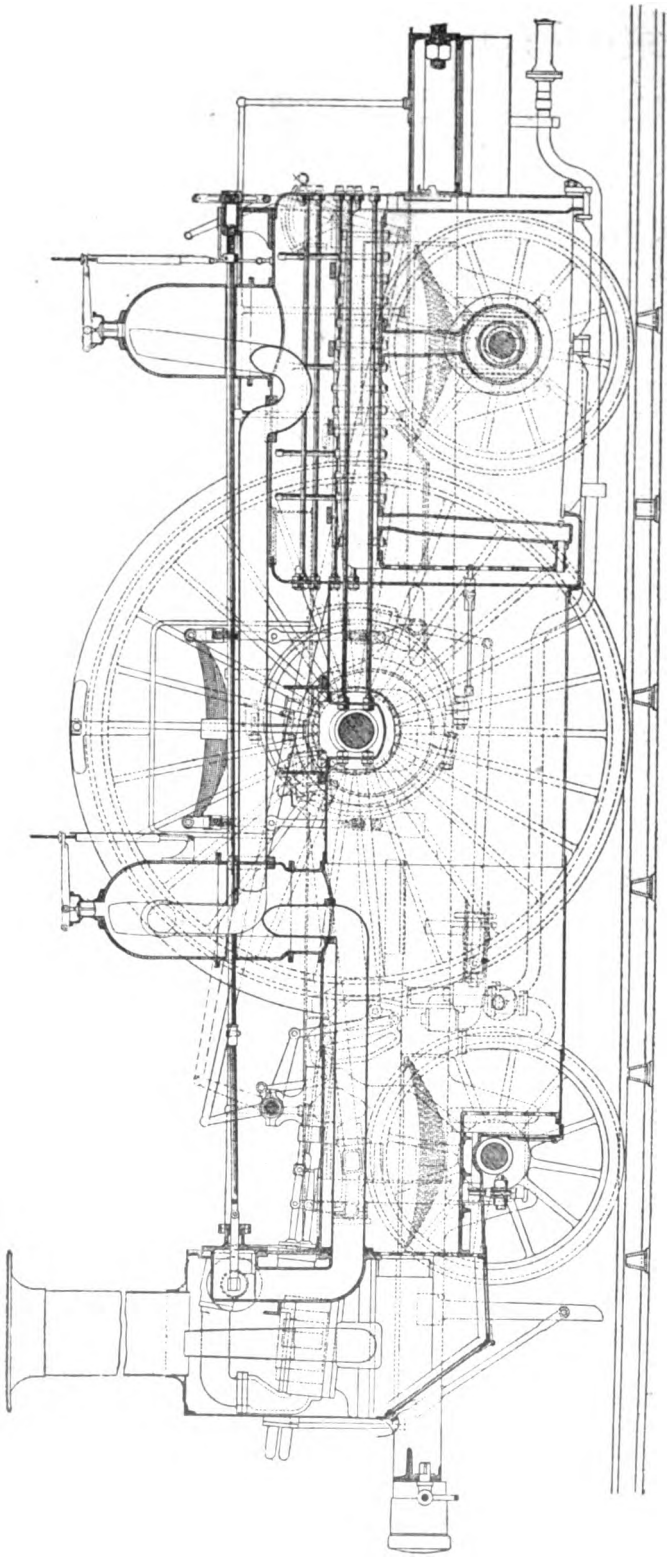
The exact details of the original boiler construction have always been more or less in doubt, but by the courtesy of Mr. C. J. Bowen Cooke, the present Chief Mechanical Engineer of the London and North Western Railway, the RAILWAY MAGAZINE, in conjunction with the *Railway Gazette*, is enabled to reproduce, on a reduced scale, the drawing from which the engine was constructed at Crewe in 1847; and some alternative designs.

One of the drawings shows the *Cornwall* as an eight-wheeled engine, there being two pairs of leading wheels in place of the one appearing on the official drawing reproduced on page 144. The engine has many times been illustrated* in outline as an eight-wheeler, but there is no evidence, so far as we can discover, that it ever ran in that condition. The fact that a drawing of this kind existed and was published on several occasions, in many different books and periodicals, indicates that the construction of the engine

* "Life of Richard Trevithick," published 1872.

* An illustration in a catalogue of the Great Exhibition, 1851, is an outline drawing of the *Cornwall* as an eight-wheeled engine.

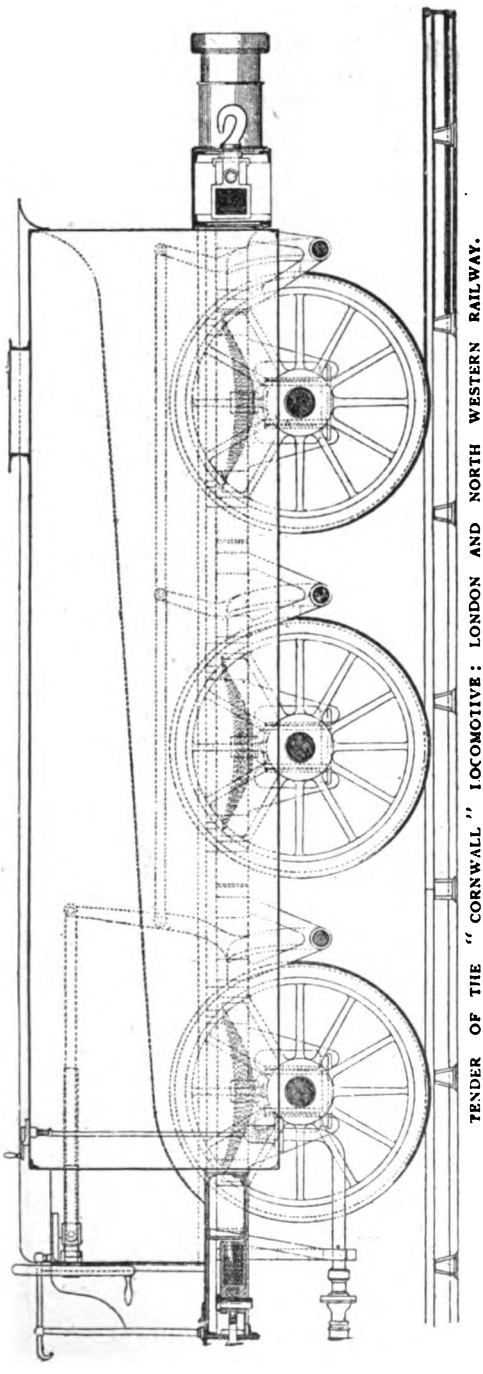
Digitized by Google



THE "CORNWALL" LOCOMOTIVE: LONDON AND NORTH WESTERN RAILWAY.
Reproduced from the original drawings from which the engine was built at Crewe in 1847.

Digitized by Google

as an eight-wheeler was carried out, even though it may not actually have worked as such. It must be remembered that the contemporary high-speed locomotives for the broad gauge

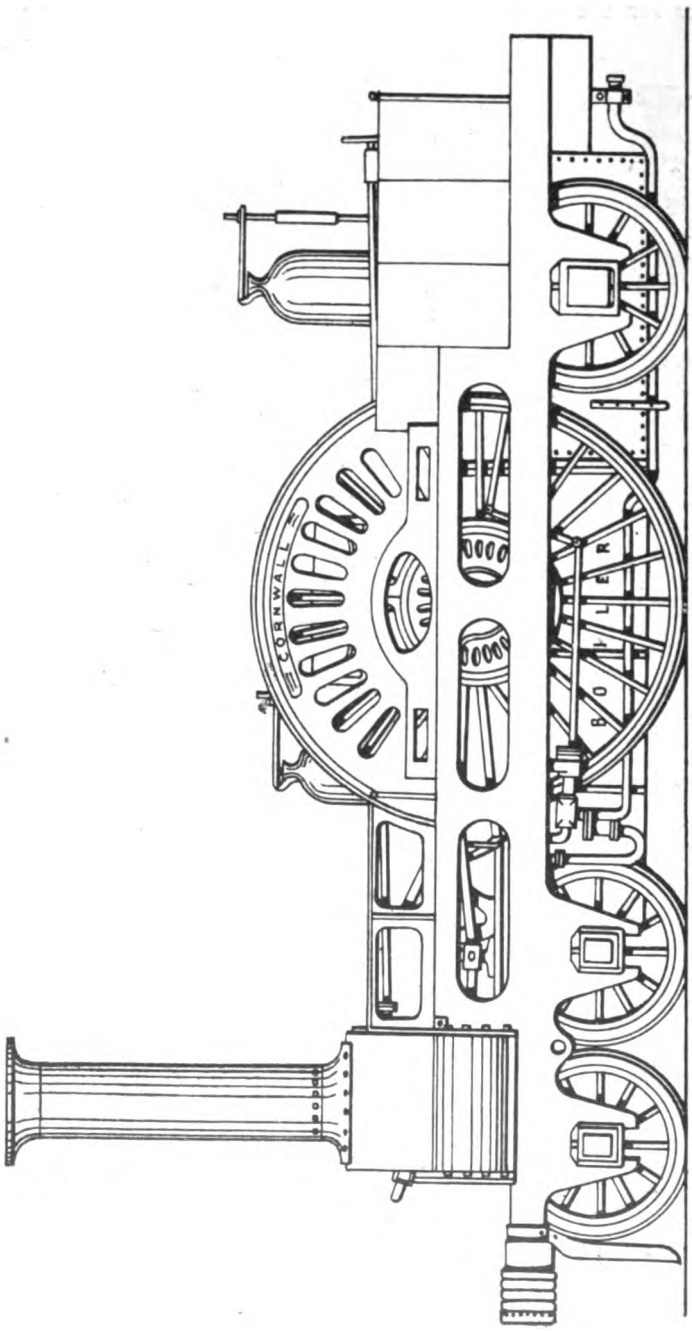


TENDER OF THE "CORNWALL" LOCOMOTIVE: LONDON AND NORTH WESTERN RAILWAY.
Reproduced from the original drawings from which it was built at Crewe in 1847.

were being built on eight wheels, with a large pair of single driving wheels, and it is possible that Trevithick began by planning his engine on the same lines with regard to wheel arrangement. As against this, however, we have the word of one who has studied locomotive history very closely, to the effect that the engine was "converted from eight wheels to six in 1858 at Crewe"; whilst according to another statement this conversion was effected by Ramsbottom in 1862. In D. K. Clark's book, which for many years was the recognised authority of the history and development of the locomotive, the engine is shown with two pairs of wheels in front of the drivers, and again, in Mr. Bowen Cooke's work, "British Locomotives," the same thing occurs. Colburn, in his work published in 1871, produced a sectional drawing of the *Cornwall* as an eight-wheeler, and in the accompanying text acknowledges his indebtedness for the use of the original to someone, whose name or identity is not however disclosed.

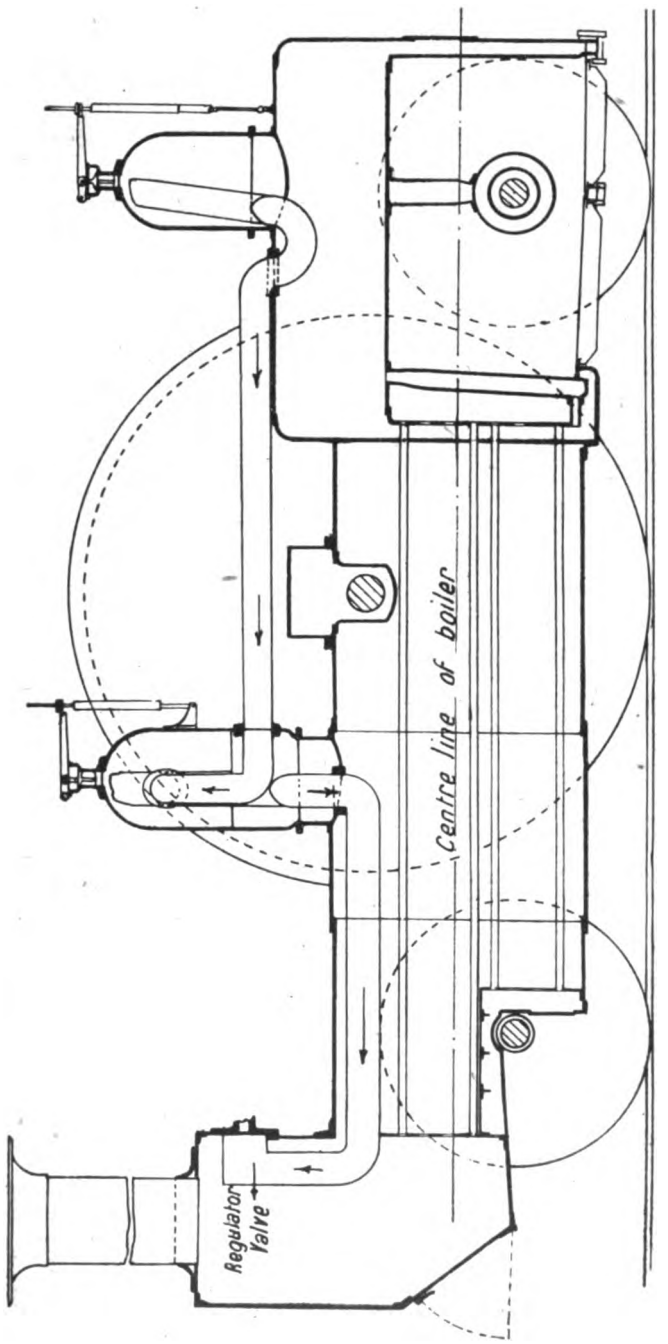
As before mentioned, the most interesting departure from the usual in the design of the *Cornwall* was the utilisation of a boiler placed below the driving axle. This boiler was provided with two steam domes, one mounted upon the front ring of the barrel and the other upon the firebox. Steam first of all entered the dome above the firebox and travelled forward from there through a pipe outside the boiler to the front dome mounted upon the barrel. From this point it passed by an internal pipe to the smokebox, in which the regulator valve was located. This valve was operated by means of a long rod running along above the boiler and passing through both steam domes, terminating at the footplate end in a hand wheel by means of which the driver controlled his engine. Each dome had safety valves of the spring balance type mounted above it. The boiler tubes were of two lengths, the upper ones being carried forward to the smokebox tube plate, whilst the lower ones were secured in a secondary tube plate behind the axle of the leading wheels, the boiler being recessed at this point, allowing the necessary clearance of the axle. The smokebox door was arranged at an angle, as shown in the drawing, and below the buffer beam, access being

Digitized by Google



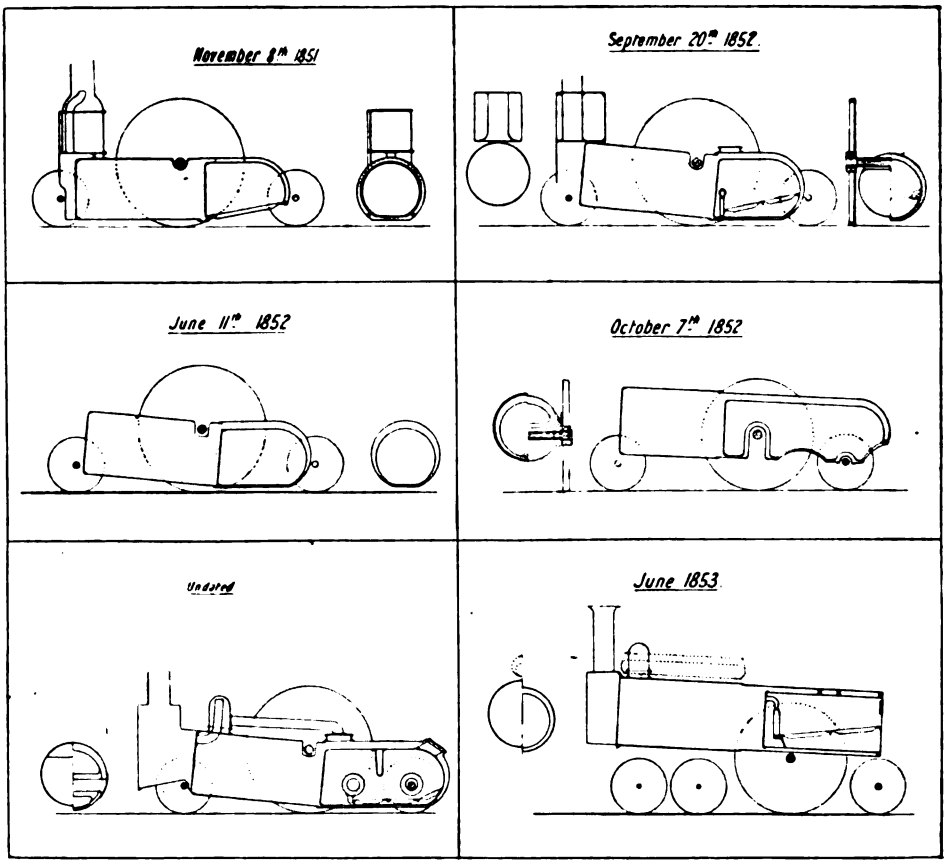
THE "CORNWALL" AS AN EIGHT-WHEELED ENGINE.

Digitized by Google



BOILER FITTED TO THE "CORNWALL" WHEN FIRST BUILT IN 1847.

Digitized by Google



ALTERNATIVE BOILERS PLANNED FOR THE "CORNWALL" LOCOMOTIVE AT CREWE WORKS BETWEEN 1851 AND 1853.

gained to the upper tubes through this, whilst a separate hinged opening below the axle of the leading wheels was provided for the lower tubes, the space for ash collection being apparently very small in the latter instance.

The crown plate of the firebox was provided with girder stays, and the drawing shows what is apparently a water leg or circulating tube passing from the top to the bottom of the inner firebox, and communicating by a passage with the front water space. There is also a tube which communicates at its upper end with the water space above the crown plate and at its lower end with the tube or housing through which the axle of the trailing wheels passed from one side of the firebox to the other. It is difficult to follow this point of the construction, and it would seem that the wheels must have been mounted in place *after* the axle had been passed through the above-mentioned tube.

Presumably the main idea in constructing the boiler in this fashion and mounting it below the axle was that of keeping the centre of gravity as low as possible, thus obtaining a large boiler area and heating surface, and at the same time ensuring complete safety in running at high speeds. It was thought at that time by most locomotive engineers that mounting a large boiler in the ordinary manner would make an engine top-heavy, and was therefore a practice not compatible with safety in narrow gauge locomotives running at high speeds. The boiler was filled by means of a pump or pumps worked off the cross-heads. By Mr. Bowen Cooke's courtesy we are enabled to reproduce a series of drawings of proposed boilers, the features of which were worked out in the drawing office at Crewe

Digitized by Google

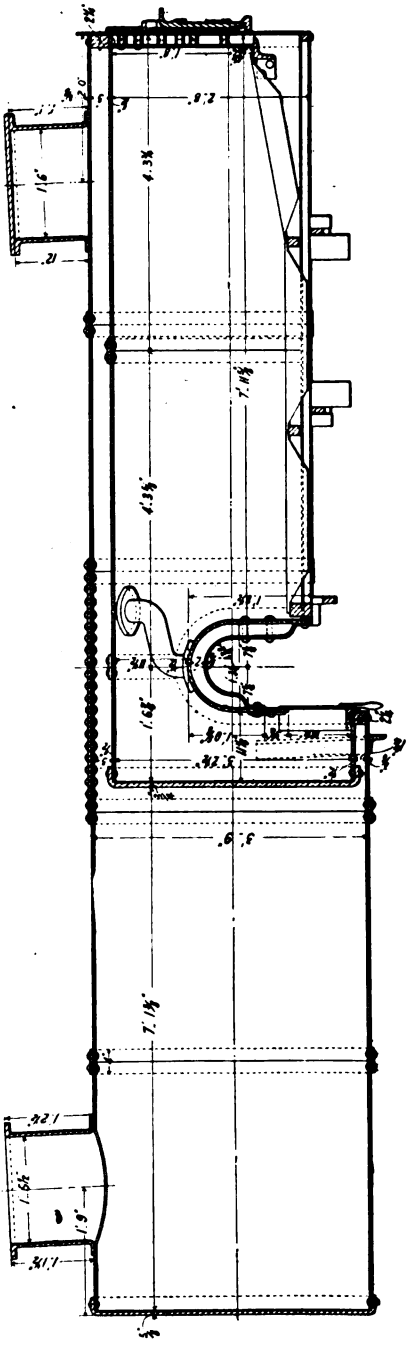
in the years following upon the building of the *Cornwall*. One of these shows the boiler as planned to lie above the axle and in this eight wheels are seen, whilst the driving wheels are of reduced diameter. Another separate view shows a boiler planned in 1854, and which apparently was to be partly above and partly below the axle.

The cylinders of the *Cornwall* were mounted high up above the frames, and steam was distributed to them by means of link motion actuated by eccentrics placed outside the driving wheel on each side, these eccentrics being slightly larger in diameter than the throw of the crank. The cylinders had a diameter of 17½ in. and piston stroke 24 in. As seen by the note on the lower end view of the folding plate, the steam-chests were altered on April 30th, 1852. This note appears on the original drawing. The alteration necessitated some modification of the steam piping, and was probably the result of some trouble which arose in connection with the steaming qualities of the engine.

It has already been stated that the engine was rebuilt at Crewe in the year 1858, the drawings for this conversion being made and signed by the late Mr. F. W. Webb, who was then chief of the drawing office at Crewe. The general appearance of the engine after the year mentioned was very little different from what it now is. The cab was, however, added 20 years or so later, and the original chimney gave place to one of the standard London and North Western Railway design. The appearance of the engine at this period is shown in the photographic illustration on page 150.

At one time the *Cornwall*, we understand, worked the old down Limited Mail from Crewe to Carlisle occasionally, although it was hardly a suitable type of engine to negotiate the Shap incline with success. In 1877 it frequently worked between Crewe and Chester, and returned by way of Whitchurch and Shrewsbury. For some time it was stationed at Crewe, but did not work any very important trains until after a second rebuild by Mr. Webb, which took place, we believe, during the "'eighties." In this rebuild the old Ramsbottom brass safety valves were replaced by those of Webb's pattern enclosed in a casing, and the Ramsbottom pattern flat smokebox door, which opened vertically on horizontal hinges, was removed, the present standard dished door being mounted in its place.

In 1886 the old number 173 of the *Cornwall* was taken by one of the three-



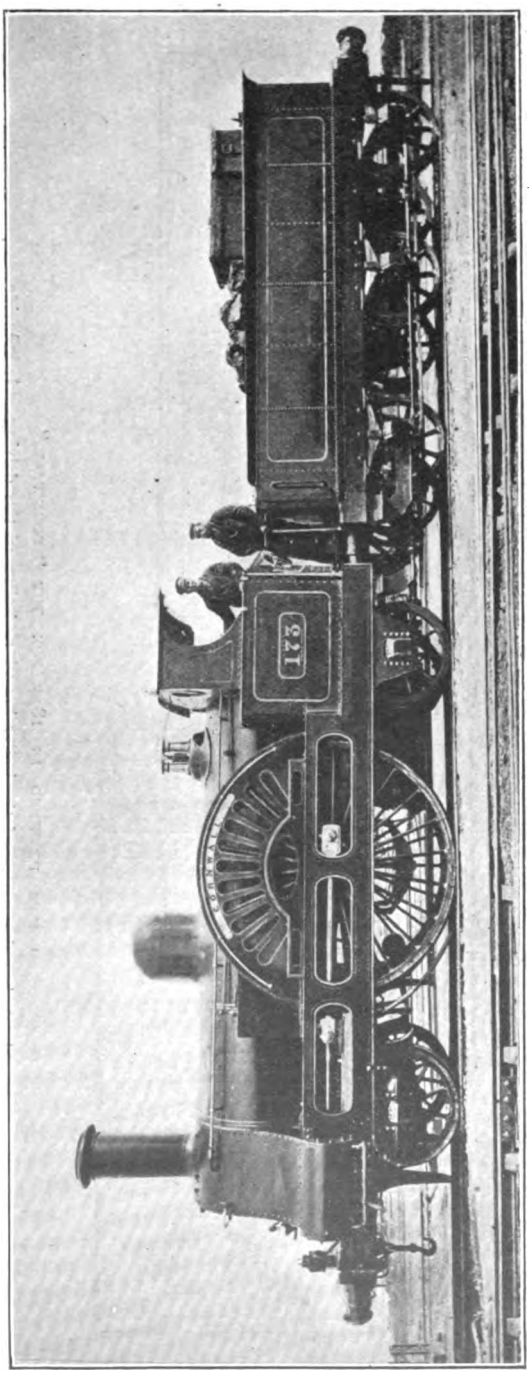
BOILER DESIGNED IN 1854 FOR THE "CORNWALL."

In this design the centre of the boiler barrel and that of the driving axle coincide.

Digitized by Google

cylinder Webb compounds of the "Dreadnought" class, and the *Cornwall* received its duplicate list number, 3020, which it has borne ever since.

After the second rebuild the engine was stationed at Edgehill, and from November, 1890, to May, 1902, took its turn on the fast 40 and 45-min. expresses running between Liverpool and Manchester, whilst between 1886 and 1890 it, on occasions, ran fast trains between Manchester (Exchange) and Chester. It always appeared to do good work on the Liverpool-Manchester services, and was an object of much interest to the travelling public on that much-frequented route. After 1902 it was taken out of service for a time and remained at Crewe, but subsequently entered upon a new lease of life in its present guise, attached to the Chief Mechanical Engineer's inspection saloon.



THE "CORNWALL" AS IT APPEARED IN OR ABOUT 1876 WITH "ORDINARY" BOILER AND STANDARD LONDON AND NORTH WESTERN FITTINGS.

The driver of the *Cornwall*, W. Ankers, who is seen upon the engine in our frontispiece, commenced his service with the London and North Western Railway at Crewe shed in December, 1867, entering the works in July, 1880, as driver of engines running on their trial trips. In addition to these latter duties, he acts as driver of the *Cornwall* when official inspection trips are made by the Directors or Chief Mechanical Engineer.

Mr. Bowen Cooke, in a letter on the subject of the *Cornwall*, has made the following reference to Driver Ankers:—

"During his career as driver of the *coupe*, Ankers has been a most loyal servant to three generations of Locomotive Superintendents, and his duties have brought him in close touch with directors who are members of the Locomotive Committee.

"Ankers took very kindly to the substitution of the *Cornwall* for the old *coupe* engine, and when running the Chairman about the line has, it is believed, almost broken records for speed achieved by the most modern type of engines. This is a good deal to say, when it is remembered that the old *Cornwall* has now attained the ripe age of four score years."

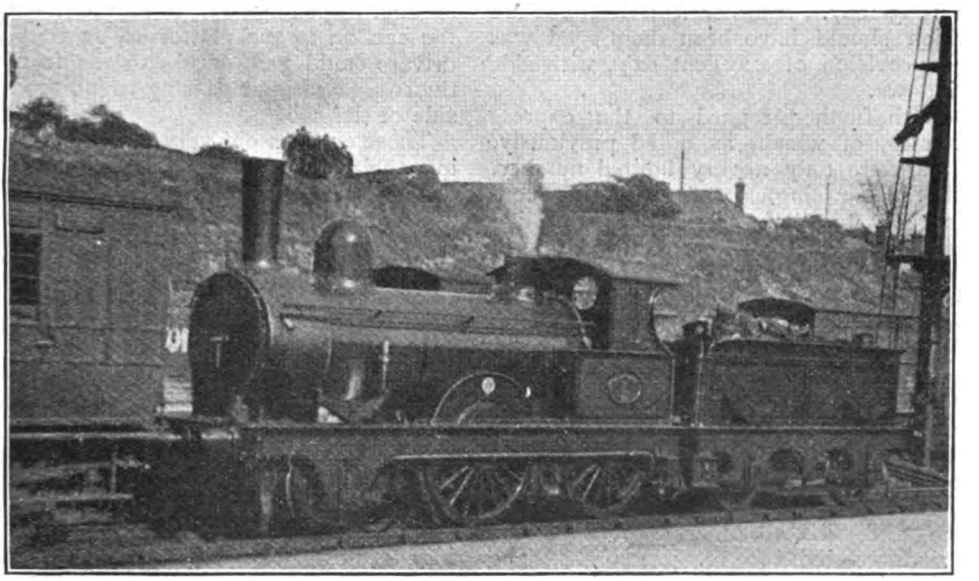
Digitized by Google

Locomotive and Train Working in the latter part of the 19th Century.

GREAT EASTERN RAILWAY. [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN 1878-9 the Great Eastern introduced certain American features into its designs. The first engines embodying these were fifteen 2-6-0 "Mogul" goods engines, with leading pony trucks, outside cylinders 19 in. by 26 in., and 4 ft. 10 in. coupled wheels. They were built by Messrs. Neilson and Co. in 1879 to without flanges, but these also were replaced later by the usual flanged tyres. Moreover, a few of the engines had the American style of sandbox on the top of the boiler, between the chimney and the dome. With the possible exception perhaps of the half-dozen Great Northern coal engines with 19 in. by 28 in. cylinders, the Great Eastern "Moguls" were

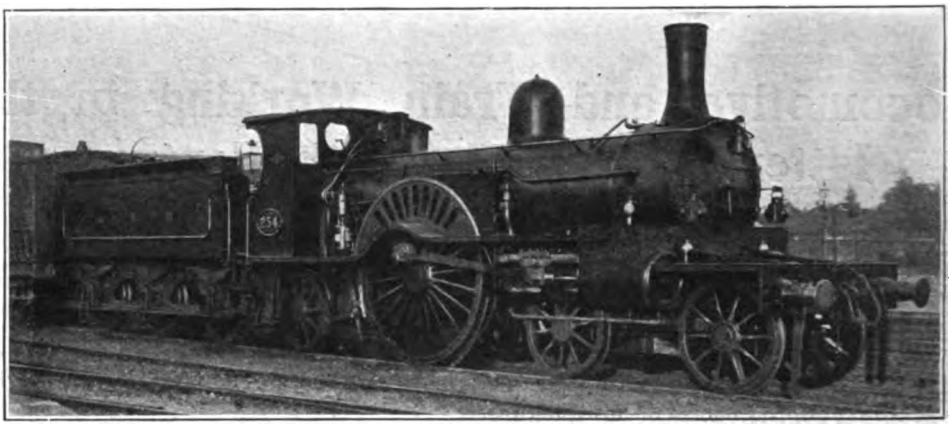


Photo] [*K. A. C. R. Nunn.*

REBUILT 2-4-0 "SHARP" ENGINE, NO. 1, AT NORWICH THORPE.

the designs of Mr. Adams, modified in certain details by Mr. Bromley. The principal American feature, apart from the leading pony truck, was the adoption of valves on the top of the outside cylinders. These were driven by rocking shafts, and when the engines first appeared they were of circular pattern, but shortly afterwards were replaced by ordinary rectangular valves. The driving wheel tyres were nominally the most powerful main line goods engines in the country. I say "nominally" because these bold departures from British standard ideas were at all events partial failures. They did not steam well, although the boilers had nearly 1,400 sq. ft. of heating surface, and they were extremely heavy on coal and oil. They lasted only some six to eight years on heavy coal trains between

Digitized by Google



4-2-2 EXPRESS ENGINE, NO. 254.
Designed by Mr. Bromley. Series 245-254, built by Dübs and Co., 1879, and 600-609, built by Kitson and Co., 1881-82.
Driving wheels, 7 ft. 6 in.; bogie wheels, 4 ft.; cylinders, 18 in. by 24 in.

Peterboro' and London, and disappeared in 1885-1887. Another American feature which should have been mentioned was the provision of excellent cabs with side windows.

With further regard to the express engines, of which, as noted previously, there were only a very limited number, the Sinclair singles were becoming considerably too light for the main line trains, though they held their own well, and were still doing very good work. Mr. Bromley, therefore, placed in service 20 very fine 4-2-2 single engines with leading bogies, outside cylinders 18 in. by 24 in., and 7 ft. 6 in. driving wheels. Of these the first ten, Nos. 245 to 254, were built in 1879 by Messrs. Dübs and Co., and the second series, Nos. 600 to 609, in 1881-2 by Messrs. Kitson and Co. They had 1,205½ sq. ft. of heating surface, and, like all other engines of this period, carried 140 lb. pressure. The design bore considerable resemblance to that of the celebrated 8 ft. singles of the Great Northern Railway, and the engines had bogie wheels of the large diameter of 4 ft. The weight in working order was about 41¾ tons, of which rather more than 15 tons rested on the drivers. These express engines also possessed certain American features. The slide valves, like those of the "Moguls," were placed above the cylinders and driven by rocking shafts. Those of the Dübs engines were circular, but the Kitson-built engines had ordinary slide valves. A very useful feature in the design was the provision of doors opening out from the front of the cab on to the platforms, so that the drivers could gain access to the front of the engine without passing round the outside of the cab.

These engines did very good work during their lifetime. In spite of the large driving wheels, and only moderate-sized cylinders, they tackled extremely heavy express trains without the assistance of a pilot engine, and the way they used to climb the Bethnal Green bank was astonishing. They always seemed to me to stand amongst certain classes of engines on different railways which did the theoretically impossible. I frequently noticed the characteristic of a peculiar lurch when running at high speeds. It was not the short "wobble" of the London and North Western "Lady of the Lakes," or the Sacré "singles" on the Manchester, Sheffield and Lincolnshire Railway, but a longer rolling motion. The difference was probably due to the presence of the leading bogie, which was absent in the other engines mentioned.

When new, engines 245 to 248 went to Yarmouth, and 249, 250, 608 and 609 to Norwich, the remainder being quartered at Stratford. Usually the Harwich boat express was worked by one of these engines. When the Worsdell 2-4-0 express engines came out in 1882-3 the stations of those at Stratford were altered; 250 and 252, together with 249, were sent to Cambridge, and the others

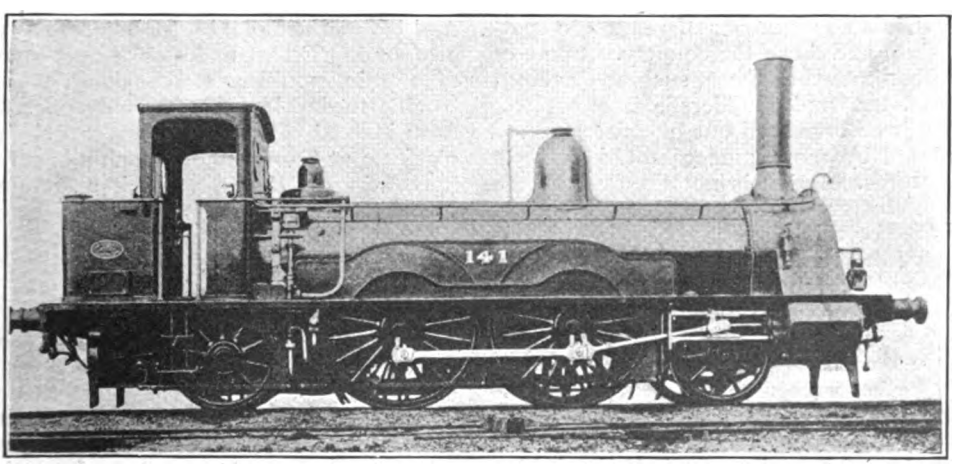
Digitized by Google

of the 245 lot to Ipswich. No. 604 went to Norwich, and 600 and 602 were for some years stationed at March for working the "Joint Line" express service to Doncaster. The fastest of the joint line trains, the 4.48 p.m. from Doncaster, was for a long time in the charge of No. 600. A peculiar accident happened to engine 603 on an up express from Norwich in 1882. When travelling at high speed between Ely and Cambridge the balance weight of the reversing motion became detached, and after striking one of the carriages of the train rebounded across the down road, just in front of a down express drawn by another of the class, No. 609, which was derailed with a large part of its train and thrown into a ditch. After this the balance weights were taken off the Great Eastern engines, and coiled springs, similar to those in use on the Great Western, were substituted. No. 251 was subsequently fitted to burn liquid oil fuel, and was the first Great Eastern express engine to be so treated. The Bromley singles had a comparatively short life-time, for they disappeared from service in 1890 to 1893.

The following is a sample performance made in 1885 of one of the class, No. 605, with seven coaches, from Cambridge to London on the 11.14 a.m. express, due at Liverpool Street at 12.30 p.m., the booked speed for the 55¾ miles being at the rate of 44 m.p.h. On this schedule the engine gained 4 minutes, and ran at an average of 46½ miles per hour. The details of the run are given below :—

M.	ch.			
		Cambridge	dep.	11.18
6	51	Whittlesford	pass.	11.28
9	76	Great Chesterford	„	11.32½
13	78	Audley End	„	11.38¼
15	59	Newport	„	11.40½
20	6	Elsenham	„	11.46½
22	24	Stanstead	„	11.48¾
25	23	Bishop's Stortford	„	11.52
29	0	Sawbridgeworth	„	11.56¾
31	16	Harlow	„	11.59
32	79	Burnt Mill	„	12.1
35	44	Roydon	„	12.3¾
38	47	Broxbourne	„	12.7½
41	51	Cheshunt	„	12.11
42	69	Waltham	„	12.12½
45	65	Ponders End	„	12.16
49	52	Tottenham	„	12.20¼
52	55	Hackney Downs	„	12.24½
55	53	Liverpool Street	arr.	12.30

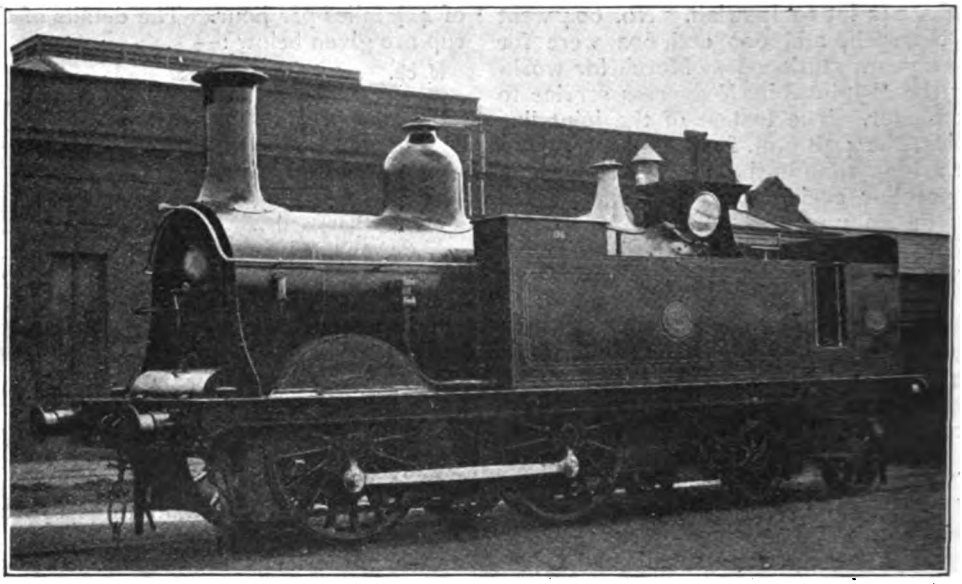
The 14 miles from Cambridge to Audley End tunnels are on a continuous rise, of which the last three average 1 in 150, and there is another bank averaging 1 in 230 from Newport to Elsenham. The mean speed from the start from Cambridge to passing Elsenham was 42.2 m.p.h., from Elsenham to Bishop's Stortford 57.3 m.p.h., thence to Broxbourne 51.2 m.p.h., and from Broxbourne to Tottenham 52 m.p.h. A much faster performance could have been accomplished, but as the engine gained 4 minutes on the booked time allowance there was no reason for faster running. Further, the line between Cambridge and London is not so suitable for high speeds as the



SINCLAIR'S 2-4-2 TANK ENGINE, NO. 141.

Series 140-159, built by Neilson and Co., 1864. Wheels, 5 ft. 7 in.; cylinders, 15 in. by 22 in.

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

0-4-4 TANK ENGINE, NO. 196.

One of thirty designed by S. W. Johnson, and built by Neilson and Co. and the Avonside Engine Co., 1872-73. Wheels, 5 ft. 3 in.; cylinders, 17 in. by 24 in.

main lines of other companies, for there are numerous curves.

With 10 coaches on the 4.48 p.m. from Doncaster, engine 600 covered the 38¼ miles from Lincoln to Spalding in 45¾ minutes, an average speed of 50¼ m.p.h.

The first mentioned of the above runs brings to mind its starting point. Cambridge is the proud possessor of a station of the old single-platform type, of which a few existed a number of years ago scattered up and down the country. Some of the best-known of these, such as Reading, Gloucester, and Huddersfield, have long since been improved out of existence and replaced by more modern multi-platform structures. And it is not the fault of the Great Eastern that Cambridge remains as it is. For this classic seat of learning is partly inhabited by a race of beings called "Dons," for the most part very amiable citizens in private life, except when they happen to be proctors. But when the don comes into touch with railway matters he becomes an archaic, with a time-honoured, thoroughly deep-rooted (and possibly sub-conscious) objection to the intrusion of "our iron roads." Cambridge also possesses a sort of "Naboth's vineyard" in the shape of a piece of ground which was coveted by the railway company as a necessary means of altering and enlarging the station. Consequently Naboth, in the shape of dons "et hoc genus omne," naturally objected. The classical don could not for the life of him be made to understand why any railway should wish to alter a single-platform station. Did not Rome in all her ancient glory manage to exist "from the foundation of the city" without two platforms? And his mathematical brother came to the profound Q.E.D. conclusion that the locus of a train would cause considerably less trouble to find if there was only one platform instead of two. Moreover, this one platform at Cambridge is such a beautiful illustration of Euclid's "obiter dictum" (per Todhunter) that "a line is length without breadth." In fact, it has considerably more length* than even Euclid would have thought either necessary or convenient.

In 1888 Foxwell ("Express Trains, English and Foreign"), himself a Cambridge M.A., wrote: "The Great Eastern had prepared a Herculean scheme for the complete transfiguration of its station and network at Cambridge, where four rival

* The platform was then 418 yards and is now 458 yards long.

Digitized by Google

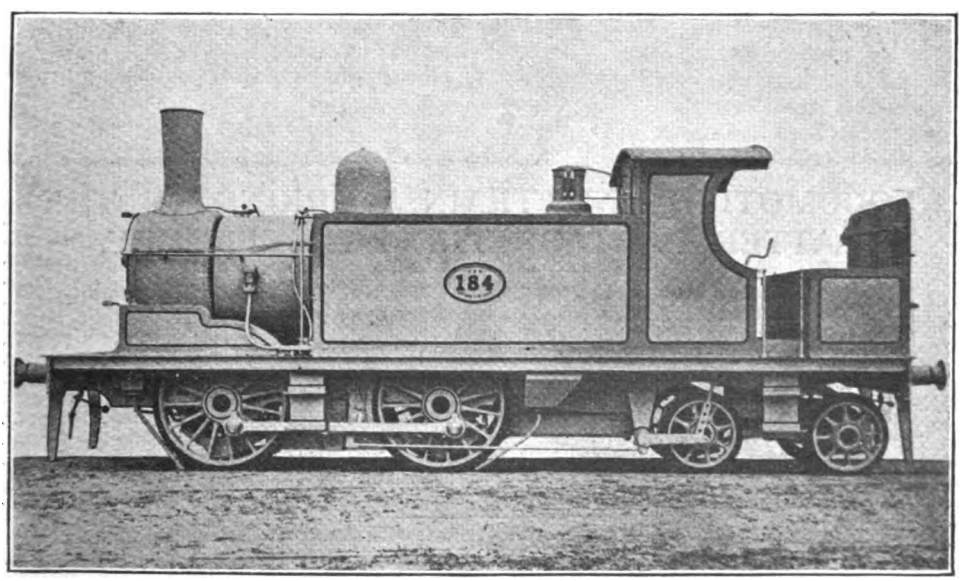
companies embrace in a tangle of mutual inconvenience; but this godsend was stupidly declined, chiefly owing to opposition fabricated by members of the University, who by tradition take the blind side in railway matters."

One must not, however, place the whole of the blame on the shoulders of the university authorities; the town also joined with them in certain objections because the railway proposed to take away a small portion of Coldham Common, the Naboth's vineyard in question. The company offered to buy land of equal value and amount on the far side of the common, and so make up for the portion taken, but Cambridge—town and gown combined—would not hear of it.

The old station was quite a curiosity. The Newmarket branch started from a bay at the north end, curved sharply to the right, and crossed both the passenger and goods lines and several sidings almost at right angles. There was also a very sharp curve from the main platform line which connected with the branch as it crossed the yard, and this had points in the main line controlled by hand at a date —somewhere about 1890—when such things could be found nowhere else in the country. The Newmarket branch was afterwards diverted and the main platform lengthened. This alteration, which was finished in 1896, is the only one that has been made.

With the exception of this modification, station architecture at Cambridge still remains, pending developments, in the throes of a "status quo ante." But if the railway company had only summoned up sufficient courage to take the bull by the horns, and arranged for every express train for a time to run through Cambridge without stopping, on the plausible grounds that there was not sufficient accommodation, and have just left the regulation minimum number of parliamentary slow trains, the university authorities might have capitulated. For "every don has his day," and even a proctor likes to go up to town occasionally for the enlivening of his soul and the assimilation of new, up-to-date wrinkles, useful in the exercise of his proctorial duties.

Tank engines for local passenger traffic have always been a feature with the Great Eastern, which is natural when one considers the vast suburban traffic of this line in the neighbourhood of London. The first passenger tank engines with the now well-known 2-4-2 wheel arrangement were built for this line, except that the pioneer



Photo] [*Locomotive Publishing Co., Ltd.*

0-4-4 TANK ENGINE, NO. 184.

Adams' class, 170-184. Built by Kitson and Co., 1878.
Driving wheels, 4 ft. 10 in ; cylinders, 17½ in. by 24 in.

Digitized by Google

engine of the type commenced work a few months earlier on the St. Helens Railway. The Great Eastern placed 20 of them in service in 1864-5, with outside cylinders, and a Bissel truck.

These engines, Nos. 140 to 159, were not of large size, though quite up to the standard of the period when they were built. They had 5 ft. 7 in. wheels, 15 in. by 22 in. outside cylinders, and 120 lb. pressure. When I remember them first in 1878 they were working local trains into and out of Fenchurch Street, a duty which they then shared with the old single-wheel tank engines of the Blackwall Railway.

Not only was the Great Eastern almost the pioneer of the 2-4-2 tank engine, but it was absolutely the first railway to introduce the modern 0-4-4 side tank passenger engine. The credit for this type, which has since become one of the British standard tank engines, is due to Mr. S. W. Johnson, who placed 30 of them in service of a design almost identical with his later tank engines for the Midland. The Great Eastern engines had 5 ft. 3 in. wheels and 17 in. by 24 in. cylinders, and worked in the London district from 1872 for more than 20 years, after which they were transplanted to local country branches.

Mr. Adams continued the same type, but preferred smaller 4 ft. 10 in. driving wheels, possibly on the grounds of quick starting from the London suburban stations, and placed 50 of these engines on the line. But Mr. Bromley, though he built 60 of the same type, reduced the cylinders of his engines from the 17 in. and 17½ in. by 24 in. of the previous tank engines to the small size of 16 in. by 22 in., for reasons which I do not know. These were largely used on the Liverpool Street, Fenchurch Street, Palace Gates, and North Woolwich lines, and some were fitted with short chimneys and condensing apparatus. The above engines, like those of Mr. Adams, had wheels only 4 ft. 10 in. in diameter, but Mr. Bromley also built ten engines, Nos. 140 to 149, in 1882 with 5 ft. 3 in. wheels and 16 in. by 22 in. cylinders. These, however, were rarely seen in the London area, and their work was confined principally to country branches. They were subsequently rebuilt with a single pair of trailing wheels in place of the bogie, probably in order to obtain a more even distribution of the weight to suit the light permanent way of some of the branches.

(To be continued.)

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—

L. & N.W.: Jan., Feb., March, May, 1915. (All out of print except May.)
Great Northern: June, July, 1915. (Out of print.)
M. S. & L.: Aug., Sept,, Oct, 1915. (Aug. out of print.)
Great Western: Nov., Dec., 1915. (Dec. out of print.) Jan., Feb., March, April, May, June, July, [Aug., 1916. (Jan. and Feb. out of print.)
Glasgow & S W.: Sept., Oct., 1916,
North Eastern: Nov., Dec., 1916. Jan., Feb., March, April, May, 1917. (Jan. out of print.)
South Eastern: June, July, Aug., 1917.
Lancashire and Yorkshire Railway: Sept., Oct., Nov., 1917.
London, Chatham and Dover Railway: Dec., 1917; Jan., Feb., 1918.
Caledonian Railway: March, April, May, June, 1918.

In October Mr. Ahrons will continue to deal with the Great Eastern Railway.

Digitized by Google

Some West Country Gradients
(THE SOUTH DEVON BANKS.)

By W. SCOTT, B.A., A.M.S.E.

EVERYONE who knows anything about the railways of Great Britain is aware that between Newton Abbot and Plymouth, on the Great Western main line, there are some very stiff gradients, chiefly on four remarkably sharp inclines (two of which have to be climbed by trains in either direction); these are mostly known as the Dainton, Rattery, and Hemerdon banks, the first named being "A"-shaped, with east and west slopes; down (*i.e.*, west-bound) trains have to climb the Dainton east slope and Rattery bank; up trains the Hemerdon and Dainton west slope. Few, however, seem to know that on the two Dainton banks are pitches definitely steeper than 1 in 40, while all four inclines have some unusual features not often found on the steep sections of a main line. So, ere the chapter of British Railways Before the Great War be shut and looked on as ended, it seems worth while to describe these banks in some detail.

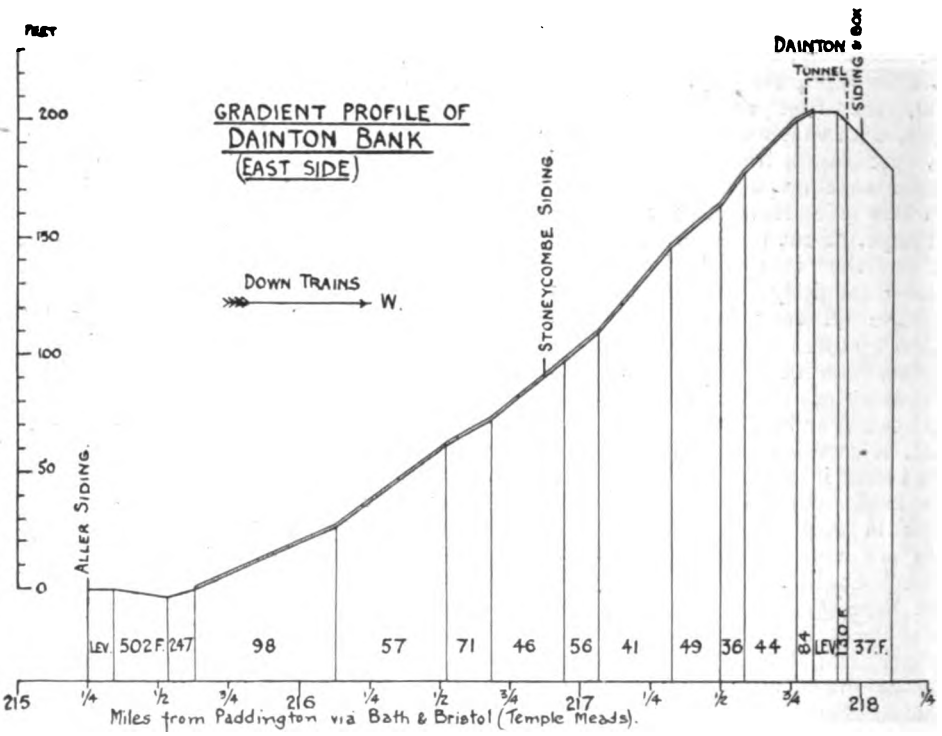
To begin with, these are the stiffest grades in Europe over which express trains are run without a "bank" or "pilot" engine. The Lickey incline (from Bromsgrove northwards, on the Bristol-Derby line of the Midland), which is longer than the steep parts of the two Daintons and of a harder average grade, is held to need a bank engine in all cases, although some of the trains going over it are far from heavy. On the approaches to the Gothard Tunnel, which in parts are as steep as 1 in 38, helping engines are always used; while the booked speed from the last stop to either station (Goeschenen or Airolo) at the tunnel mouth is not more than 29 miles an hour. But the Limited (before the War, of course), with a load seldom less than 200 tons behind the tender—often more than that—was timed to average well over 40 miles an hour between Newton (passing slowly) and Plymouth North Road, both down and up. Even to-day, with speed kept down to 60 m.p.h. at most, to save coal, the start-to-stop time for the 32⅝ miles, Newton to North Road, or *vice versa*, is only 50 min., an average of over 38½ an hour, with many service-slacks for curves, as well as the heavy grades.

Another odd thing about all these banks is that their remarkable steepness is not owing to the lie of the land itself. Of course, South Devon is a hilly region, but on this side of the county there are no mountain-tops, as there are—of over 2,000 ft.—on the northern side of Dartmoor; nor are any of the hill-slopes at all precipitous. Any one who has ridden a (pedal) cycle from Plymouth through Wrangaton to (say) Brent will know that, though mostly against collar, the turnpike road has no steep rise at all answering to the Hemerdon bank; in fact, except for a fairly hard bit along the village street of "Ridgeway" (part of Plympton-St. Mary), the road is only an undulating one, with an upward trend for the east-bound rider. Yet by Wrangaton station-bridge the road is about 30 ft. higher than the railway summit. The summit (tunnel) at Dainton is not reached by any high-road, but—unlike "Shap" and "Beattock" summits—it is certainly not a hill-top for anything except the line of railway at that point. The truth is that Brunel, having meant the South Devon Railway to be worked on the Atmospheric principle, was not afraid to follow the ground-level, within certain limits; thus deviations which were quite practicable, and would have been made for a line on which steam locomotives were to run, were thought needless in the case of atmospheric traction. Unluckily, though no worse on steep grades than on the flat, the "Atmospheric" was a failure everywhere; trains used to come to a dead stand on the dead level of Dawlish sea-front* just as much as on the Dainton

* See note at end of article as to level, etc., at Dawlish.

Digitized by Google

banks. The luckless Atmospheric has long ago faded away into "the infinite azure" of the past, but its nightmare gradients abide; as do (happily) a few of those picturesque stationary engine-houses — *e.g.*, at Starcross, Totnes, and north of Kingskerswell—with their graceful *campaniles*, and their blue or red stone bodies, topped with curved tiles. It was worthy of Brunel to design those Italian structures, and to uprear them in a land so like Northern Italy; they adorn (instead of disfiguring) the loveliest landscape. But the grades



comes, at the 215¼ mile-post), there is a faint fall (at 502) for 12 chains or so; then, just beyond the ½-mile-post, the rise begins which lasts to the summit tunnel at Dainton. Just at first this is only at 247, but then the true "bank" starts at 98. This point is perhaps 10 chains (barely) beyond the 215½ mile-post, or just 1½ west of Newton Station; reckoning from this somewhat vague starting-point, the whole bank is about 2 miles long, plus a few chains. The 98 grade lasts for all but half-a-mile, steepening to 57 about midway between the 216-mile-post and the next ¼-mile one. The 57 grade is just 30 chains long, and eases to 71 soon after the 216½ mile. This "easier" slope only lasts for a dozen chains or so; after which the really steep section of the bank begins, lasting for a little (say 10 chains) over a mile; in this bare 2,000 yards there is a rise of fully 130 ft., and the gradient changes seven times, the grades being as follows: 46, (56), 41, 49, (36), 44, and (84); the parentheses mark the strips of less than 10 chains. The 46 grade is all but a quarter-mile long; near its western end

are another matter; let us look at them in some detail.

[Henceforward, throughout this article, "1 in —" must be understood before the figures for any grade, *e.g.*, "40" may be read as "1 in 40," and so on.]

1. DAINTON (EAST SLOPE). — This bank begins about 1½ miles west of Newton Abbot, at a slightly higher level—say, 15 ft.—than that station. At Newton itself the line is level, but after a gentle rise at 259, and another strip of level (in which Aller Siding

Digitized by Google

comes Stoneycombe Siding (just 10 chains before the 217 mile-post, and exactly 1 mile 10 chains east of Dainton Box). The 56 strip has the 217 mile-post almost in the middle (it is just about 200 yards long); the 41 grade, a shade more than the 46 one, covers a full quarter-mile, with the 217¼ mile-post towards its western end. The climb then eases perceptibly to 49 for 12 chains or so, and at the 217½ post the fearful 36 strip begins. Luckily, this—almost the hardest express-route grade in Europe—only lasts for a little more than 150 yards; the 44 grade is about 15 chains long (say, 350 yards at most); at its western end the summit tunnel is entered. This does not quite mark the bank-top, however, as there is a very short strip at 84 for 100 yards or so in the tunnel. Then the level is reached, and lasts for a full 150 yards. When the tunnel ends the line is already inclining downwards at 130, which steepens in less than 70 yards to the sharp fall of 37 of the "western slope." Dainton signal-box is just opposite the 218th mile-post; as this is some distance down the steep slope, probably the points into the siding go out just west of the tunnel on the more practicable grade of 130. Of course the "East" bank ends when the level is reached, some 6 chains beyond the 217¾ post, but as the passing times for Dainton refer to the signal box,* it seemed well to give the exact whereabouts of the latter.

2. DAINTON (WEST SLOPE).—This is of course a climb for up trains: as there is a markedly rising "approach" from about 1¼ miles east of Totnes, it is not easy to settle the point at which the true bank begins. In this rising approach a section is as steep as 86, and *this* is sometimes taken as a part of the incline; inasmuch as this, however, is followed by much easier grades and an appreciable length of dead level, it seems better to reckon the actual bank as beginning with the 76 rise, which starts about 7 or 8 chains west of the 219½ mile-post—*i.e.*, nearly (not quite) 2¼ miles east of Totnes Station. (From the latter there is a dead-level mile, or rather more; then rising grades at 254 to 120, with a little bit of level, followed by a fairly steep strip at 86, ending in a full ¼-mile of dead level.) Including the latter, this approach is over 2 miles long, and may be likened to the 1 in 200 rise before the Beattock Bank. About the 219¾ mile-post are two short strips at 177 and 575, both rises, though the latter may be called a nominal one only, and then 8 chains or so before (*i.e.*, west of) the ¼-mile-post the true bank begins at 76. The distance thence to the summit is less than 1¾ miles (perhaps 1 mile 55 chains), so that the incline is shorter than the eastern slope‡; but then it has a definitely upward approach instead of an almost level one. The 76 section is about 16 chains long, and is followed by three short strips at 128, 80, and 133, of which the middle and hardest section at 80 is the longest; these three together cover a little over a quarter-mile. Some chains west of the 219th mile the grade steepens to 55 for a full ¼-mile, with a strip of 65 for the next 10 chains or so. Then, after the 218¾ post (say 6 chains beyond it), the very steep ¾-mile of the bank begins, the grades thence to the summit being 38, 43, 37, and (130). The 38 stretch lasts for well over a quarter-mile (say 25 chains); about 7 chains before the ¼-mile-post this eases to 43 for some 400 yards, when the grade steepens again to 37; this very steep bit lasts for almost 12 chains. Towards the end of it comes the 218th mile-post and the Dainton signal-box, but though the passing times for "Dainton" are given to that point—it does not mark the top of the bank. East-bound trains have still 3 or 4 chains to climb at 37, and even after entering the tunnel there are about 50 yards of further rise at 130 (this last "easy" grade is some 80 to 90 yards long, but part of it is outside the tunnel) before the dead flat of the Summit is reached. If we "neglect" this last very short strip, the finish of the bank, at 37, soon after a fairly big stretch at 38, is perceptibly harder than that for the east slope; in the 50 chains or so from the start of the 38 grade to the end of the 37 over 95 ft. are climbed. This is harder than any part of Hemerdon. The 38 grade is

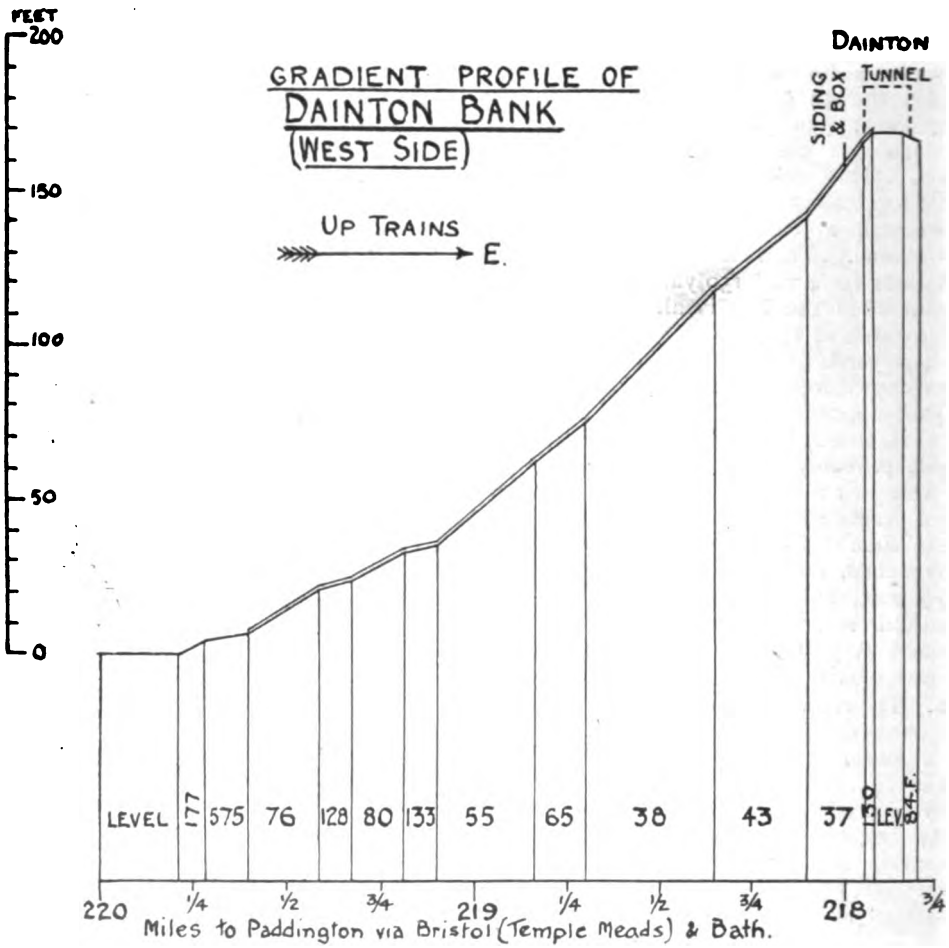
* Even under war conditions the time allowed from Newton Abbot (start to passing) is only 7 min. for exactly 4 miles, including the aforesaid 2 miles of hard climbing.

* The latter is longer by about 43 chains, being a few chains *less* than 2¼ miles long.

Digitized by Google

reckoned officially as the "ruling" one of this bank, while on the east slope, though it has the steepest pitch of all, the ruling grade is taken as 41 (probably because the strip at 36, of about 150 yards, is too short to "rule" the load); anyhow, these nightmare grades have to be climbed, and coming as they do in the course of a continuously hard rise they cannot be rushed. The two latter the harder of the two in actual working. From Newton Abbot to the Dainton summit about 220 ft. are climbed; and from the dead level at Totnes and for about a mile east of that station perhaps 225 ft.

[The profiles of the two banks have been drawn to an unusually large horizontal scale of 2 in. to the mile—*i.e.*, ½ mile in each inch, with a vertical one of



slopes of course have a common summit; the "East Bank rises about 205 ft. (in perhaps 2 1-5 miles); the "west" one begins at a higher level, and so rises only about 165 ft., but in the shorter distance of less than 1¾ miles. The average slope is nearly the same in both cases, but the definitely uphill approach on the west side, with the greater length of the pitches steeper than 40, makes the 60 ft. per inch; even if the "paper famine" oblige the Editor to reproduce them on a smaller scale, the ratio of the horizontal to the vertical will remain that of 1 to 48½ only. The profiles start at Aller Siding on the east and the 220th mile-post on the west side, to give landmarks to those who may be looking out for the banks; in neither direction is there anything to mark their exact be-

Digitized by Google

ginnings on the rail itself. But the parts deemed to be the actual "incline" are shown in the profiles with a double (or shaded) contour-line; the *lower* one of these is, of course, the true "contour." The datum-line has been taken some 24 ft. below the level of Newton Abbot station; the east bank begins about 38, and the west one about 70 ft. above this line. It must be borne in mind that with grades changing *seven* times in barely 1,300 yards, and few—if any—gradient posts, the *exact* points of changing grades, and so the precise length of each "stretch," cannot be settled with perfect accuracy. The two "profiles" are given in *opposite* directions, so that anyone reading (as he naturally would) from left to right will find the quarter-mile-posts come in the same order as when seen from a train moving west or east respectively.]

The other two banks, "Rattery" and "Hemerdon," are both of them only the steeper parts of two much longer inclines, of which Wrangaton Station is the true top; to this summit down trains climb from Totnes (about 9 miles), and up ones from the "flat" west of Plympton—say Tavistock Junction box (quite 10 miles). But as the "Rattery" bank is unlike the other three in that it is much longer, and has no pitches of "nightmare" steepness, we deal with it last, as in a class by itself.

3. HEMERDON.—This is an "up-train climb"; it is nearly the same length as Dainton East, or a shade less, and is nearly as hard on the average as the steeper part of Dainton West, but for a much longer distance. Unlike the other South Devon banks, it has few changes of grade. The upward slope from the Laira dead level begins west of Plympton Station (soon after Tavistock Junction box is passed), but this rise is mostly at moderate slopes until the steep bit at 1 in 41 is struck some 500 yards—more or less—east of Plympton. This grade is followed by a quite short bit at 47, the two stretches together covering a half-mile; then the rise steepens again to 42, and this grade lasts for fully 1½ miles, or a shade more. The top of this stretch is usually looked on as the bank-end, though there are quite short rising bits at 51, etc., immediately beyond it. As the 42 grade ends some ¾-mile short of (*i.e.*, to the west of) Hemerdon box and siding, there is really nothing to mark the exact beginning or ending of the bank, which thus reckoned is fully 2 miles long (perhaps 2 miles 10 chains). In this distance almost 290 ft. are climbed out of the 445 ft. or so of rise from Tavistock Junction to Wrangaton Station summit. Thus, though there are no "pitches" steeper than 1 in 40, the average grade is harder than in either of the Daintons [see table at end of this article]; also, as steam must be kept in hand for the further 8 miles of upward-sloping table-land (somewhat like the Hawes Junction-Blea Moor section of the Midland Carlisle line), the 41 to 42 bits cannot be rushed in any way. In the ingenious "deviations" planned by the late Sir J. Inglis, this bank could not be averted or otherwise dealt with; as it is the hardest of the four, this fact overthrew the whole plan, which is now unlikely to be carried out.

4. RATTERY.—This bank (a climb for down trains) forms the first part of the long rise from dead level at Totnes to Wrangaton summit; of this slope about 4 miles remain west of the Rattery box and siding, but at much easier grades. The beginning of the bank may be said to be from immediately west of Totnes Station, though for the first 100 yards or so the rise is only at 247; this soon steepens to 66, which lasts for about ½-mile; rising to 71 for a like distance, it then steepens to 47 (these three stretches are each very nearly ½-mile in length); at the end of the 47 section come constantly changing grades of 50, 56, and 46, with a rather longer stretch at 57 (perhaps for 800 yards), and then shorter bits again at 50, 54, and 76; after this the grade eases a good deal to 90 (for nearly a mile), and then to 95; these two stretches together cover nearly 1¼ mile. There is then a steepening for quite a short distance to 65 before the momentary strip of level at Rattery Siding, and with this the bank is usually thought to end. The actual top is reached about 1¼ mile further on, at the west end of Marley Tunnel; but in the tunnel the gradient is only 131—quite "easy" for these Alpine stretches. Reckoning to a point a little short of Rattery box, the bank, as a whole, is nearly 4½ miles

Digitized by Google

long,* in which distance there is a rise (from the level at Totnes) of fully 350 ft.; but of this about 250 are climbed in the first 3 miles, which make up the harder part of the bank. Tigley box does not come quite at the end of this, but the pointed spire of the church of that name (also called "Brooking" locally) is often said by the locomotive men to mark the end of "the worst part of the bank." Were it not for the 90-95 section at its latter end, this would be a far harder incline than "Shap," which it approaches in length. To-day the fastest trains have a 9 min. allowance from Totnes to the Rattery box—*i.e.*, an average speed of fully 30 miles an hour; but they must improve a little on this to pass Brent (2 miles 27 chains more, nearly all up-hill) in the allotted 3 min. The reputed top of the bank being some 135 ft. above the Dainton summit, or more than 50 higher than "Hemerdon," it is not surprising that speed often falls lower near Rattery box than it does at the top of the other banks, although the grades are definitely less hard on "Rattery" than on the other three.

Someone will most likely ask in reference to these "nightmare" grades at 38, 37, or 36, "How *much harder* is a gradient of 1 in 40 than one of (say) 1 in 70?" This is rather like that futile query, "What is the *horse-power* of such-and-such an engine"? Of course there is a formula in which an answer can be given, but so much hangs on endlessly varying conditions (in either case) that such an answer is apt to be only one of the many instances where "there is nothing so misleading as facts, except figures." Someone in authority has lately told us that one kind of war flour is "only 2 per cent. less digestible than the wheat flour of old days." Maybe, for Smith (who has an ostrich's digestion), but surely not for Brown, who is dyspeptic.

In the case of inclines so much depends on dryness of rails, direction of wind (with other variables), as well as train-load, pace up the bank, etc., that no definite answer can well be given. A useful table in the April number of this magazine shows a 1 in 50 grade as *rather less than twice* as hard as one of 1 in 100, but these figures are for the low speed of 10 miles an hour (for heavy freight trains); whereas on the South Devon banks the speed seldom falls below 20 m.p.h., and is mostly a good deal more. On such banks both the "average grade" and "the whole height climbed" are also somewhat misleading standards; when pitches at 36 or 38 come in the course of a steep rise and cannot be "rushed," they are very serious obstacles. To take an extreme case: Suppose that on an otherwise easy road there were 5 ft., let us say, of vertical rise, the line would be, of course, unworkable; so it would practically if (say) 300 ft. rose at an angle of 45 deg., *i.e.*, at 1 in 1. And even the shortest of the four South Devon banks, viz., Dainton west side, is long enough to make the steeper parts fully felt. The way in which through fast trains, of good average weight, were (and are) daily hauled over these at a fair speed, without any help of a second engine, is something worth noting—to say the least.

TABLE OF THE FOUR INCLINES WEST OF NEWTON ABBOT.

Name of bank.	Approximate length of bank.	Total height climbed.*	Rise of No. of feet per mile.
Dainton (East).	2½ miles.	205 feet.	(over) 93
Dainton (West).	1⅝ „	165 „	101½
Rattery	4⅜ „	350 „	80
Hemerdon ...	2 1/16 „	290 „	(over) 138
Steepest part of Dainton (West)	0⅝ „	95 „	144

* This does not mean the *total* height above *datum* line, but the actual climb from the bank-foot.

NOTE. — Dawlish Station is manifestly somewhere about 20 ft. above the level of the sea in normal weather, whatever may be the technical "sea-level" of the Ordnance Map; at the time when—as often happens in winter—the waves are throwing spray above the tops of the coaches of passing trains, or when the sea flows up the mouth of the "Dawlish Water" over the lowest of the little waterfalls, what is its "level" then? I believe that Paddington Station really stands about 75 ft. *above* technical "sea-level" (according to the Ordnance Map); hence it is probably *higher* than the levels at Exminster and The Laira, and even those at Athelney or just east of Dawlish Station. In a recent article on West of England, etc., gradients, I inadvertently wrote the opposite (following in this an official profile, in which the datum line was not meant to be a uniform one throughout).

* From Totnes Station (middle) to the box is 4 miles 44 chains; to the stop-board for up trains is 16 chains less.

Digitized by Google

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

Photo] [*Eric W. Payter.*

JERSEY EASTERN RAILWAY.

Train near Pontac Station, hauled by 0-4-2 engine, *Mont Orgueil.*

IT is possible that some readers may have been inclined to question the amount of additions to tare train-loads given in these columns recently in respect of the weight of passengers and luggage. If that be so, it is probable that any such doubters are not conversant with travel conditions as they exist to-day. The principal factor to be taken into account is, of course, the increasing use of non-corridor rolling stock by many companies on express trains. At the outbreak of war the London and North Western Railway was probably the best equipped of all the "long-distance" British companies with really up-to-date main line non-corridor coaches, and of recent months these have been pressed into very extensive use. Now a 57 ft. nine-compartment third class non-corridor coach on the L. & N.W.R. weighs 28 tons, and in view of its ample width seats a maximum of 108 passengers, six a-side. Assuming these passengers to weigh an average of 1¼ cwt. each—I used to reckon 1 1-3 cwt., but we must, I fear, make some allowance for the baneful effects of rationing!—we have a total weight of passengers, in a full carriage, amounting to 135 cwt., or 24 per cent. of the weight of the vehicle itself.

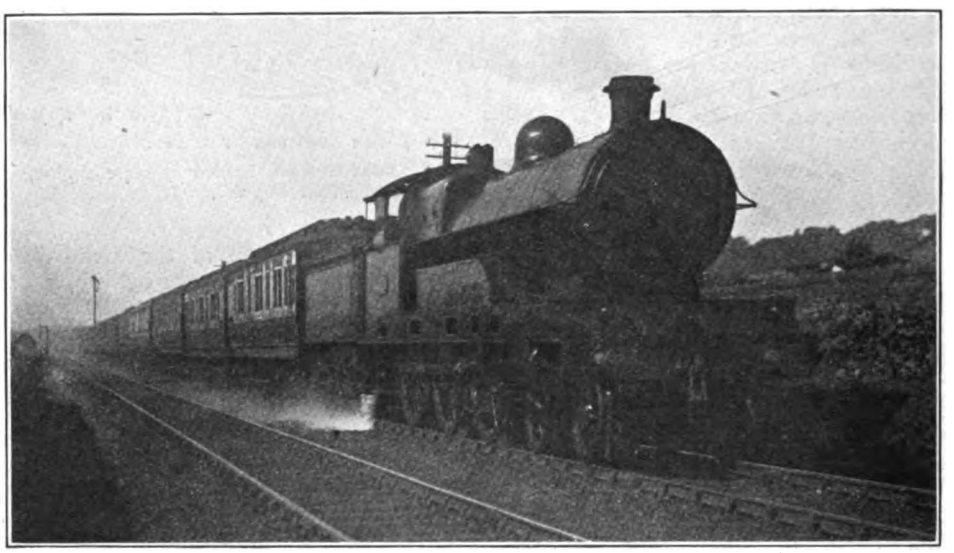
A corridor coach of the same dimensions, on the other hand, has eight compartments, in which four people can be seated a-side—no more comfortably, by the way, than the six in the non-corridor vehicle—so that the total in this case is only 64 seated passengers. On the same basis of calculation we have only 4 tons of passengers in a 30-ton corridor coach, which represents a percentage of 12½, as against 24. Needless to say, in first-class coaches the difference is smaller, as also the ratio of passenger weight to tare weight. Including first-class compartments, restaurant cars, etc., an addition of 10 per cent. to the tare train-load in the case of a corridor train roughly indicates that practically every seat is occupied, and that the amount of luggage is proportionate—a condition of affairs that was but seldom encountered in pre-war days, save on seaside expresses in the height of the season. But under present-day travelling conditions an addition of 10 per cent. to tare loads is often very far below the mark, and it becomes increasingly difficult to determine exactly to what extent tare tonnage should be increased in respect of passengers.

At the same time it is more and more a vital necessity that the weight of passengers should be added, as an increment of,

Digitized by Google

say, 20 per cent. in a modern 400-ton or 450-ton train-load is no inconsiderable item, and its omission may lead to an altogether erroneous estimate of the locomotive work performed. A few Saturdays ago I was intending to make a run on the 1.30 p.m. from King's Cross to Doncaster, but thought better of it after a sight of the train at the terminus five minutes before starting time. It was made up to *seventeen* bogie vehicles, one of which was a 12-wheeler, so that the aggregate number of axles was 70, and the tare tonnage was 462. Half-a-dozen or more vehicles were non-corridor, and not only were corridors and even luggage vans full of people, but others were standing in corridors, compartments, and brakes.

Needless to say, no blame attaches to the Great Northern Railway for this state of affairs—it is preferable, indeed, to announce a policy of "no relief trains" and to adhere to it, thereby compelling those who travel without adequate cause to realise the serious nature of the times in which we are living and the drastically limited ability of the railway companies to handle passenger traffic. Of course, such conditions as those cited are principally in evidence at the week-ends, but several companies continue to run numbers of relieving trains at these times of pressure despite the terrible warnings



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

Perth to London express passing Penrith.
4-cylinder superheater 4-6-0 locomotive, No. 650, *Lord Rathmore* ("Claughton" class).

even standing in the *compartments* of the non-corridor coaches.

In these circumstances, I have not the slightest doubt that, in arriving at the total weight of that train, it would be necessary to add at least 70 tons for passengers and luggage, making an aggreate of fully 530 tons. The rough method by which this result is arrived at is to add 10 per cent. in respect of seated passengers in the corridor portion of the train, and 20 per cent. for those in the non-corridor coaches, to the tare weight of each of these portions respectively, together with a further 6 tons (a very moderate allowance) for those as to the impossibility of doing so that continue from time to time to appear in the newspapers In mid-week, however, travelling is still reasonably comfortable at the time of writing—generally speaking, at any rate—and such estimates as have just been cited in respect of passenger load do not, of course, apply at such times.

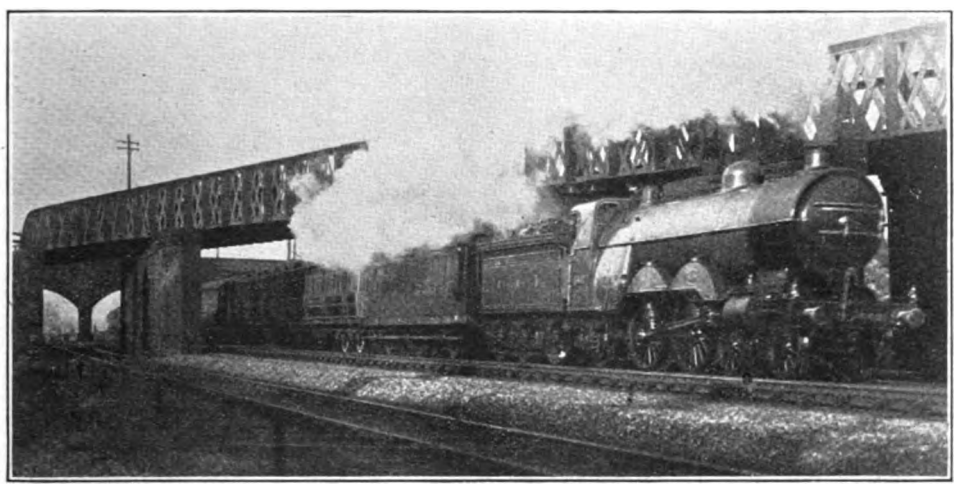
Reverting, however, to the question of maximum seating accommodation in modern expresses, I should like to quote some remarkable examples. Perhaps the most outstanding is that of the 3.50 p.m. Birmingham and Liverpool express *ex-*

Digitized by Google

Euston, L. & N.W.R., several recent trips on which will be found detailed in the latter part of this artice. The Birmingham portion of this train consists of a 7-coach non-corridor "set," and the Liverpool portion of a similar 6-coach set, together with an added corridor composite and a brake, totalling 60 axles, or 411 tons tare weight. Reckoning six a-side in the third class, which these wide vehicles can certainly accommodate of reasonably-sized people without undue discomfort, we have here an aggregate seating capacity of no less than 1,196 passengers. On the 1¼ cwt. per passenger basis, an absolutely full train in these circumstances would require an addition of no less than 75 tons! Adding a further 4 tons for luggage, our 411 tons tare weight would thus be swollen to as much as 490 tons by an increment of over 19 per cent. The up express due in Euston from Manchester and Birmingham at 4.45 p.m., also referred to later, is similarly made up—indeed, all the Birmingham trains and the majority of those to and from Manchester and Liverpool are now almost entirely composed of non-corridor stock, although the up-to-date character of that stock compensates in large measure for the discomforts now suffered in comparison with pre-war travel.

Not so, however, the Gresley "twin" suburban trains, which make their appearance on certain popular Great Northern expresses, and with their straight backs and confined space between the seats must prove very uncomfortable to the long-distance traveller. Here, again, is a case of maximum seating capacity in relation to tare weight, as these sets of four "twin" coaches scale 152 tons and seat 632 passengers. An absolutely full train in this case would, therefore, mean an addition of 39½ tons, or no less than 26 per cent., to the tare weight of the vehicles, in order that the gross load hauled by the locomotive may be estimated. The set trains referred to are usually now employed on the 4 p.m. Leeds express *ex*-King's Cross, in company with corridor and semi-corridor vehicles for York and Grimsby. Elsewhere the Great Eastern 3.10 p.m. *ex*-Liverpool Street—a 64-axle train weighing approximately 350 tons—can accommodate approximately 820 people, or 51½ tons of passenger weight, apart from luggage, which is usually considerable in quantity. Now the figures just given only apply when the trains are full—i.e., when every seat is occupied. But when, in addition, passengers are *standing*, it is safe to assume that even these substantial increments do not fully represent the addition which should be made to the tare load in order to arrive at the gross load.

As I have said previously, it is by no



Photo] [*Chas. S. Lake.*

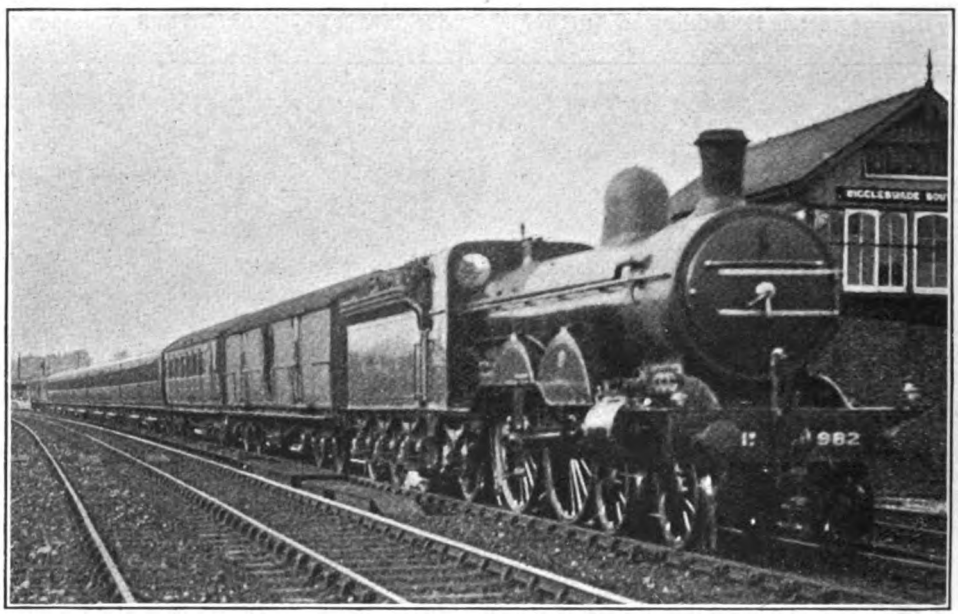
GREAT NORTHERN RAILWAY.

Up mail train from Leeds passing under London and North Western Railway bridge at Sandy at 60 miles per hour.

Digitized by Google

means an easy matter to reckon the weight of passengers and luggage, and the difficulty is greater than before at the present time, when, owing to the enhanced accommodation of the trains and their crowded character, it is more than ever necessary to arrive at an adequate estimate of the tonnage involved. Only a careful study of the composition of the train and the relative "fullness" of its constituent parts—a somewhat thankless task in these days owing to the probability of losing one's seat while so employed!—can enable this figure to be obtained with any accuracy. The relative ratio of the tare weight of coaching stock to its passenger accommodation, which varies considerably on different lines, must also be borne in mind when fixing percentages. In this connection I should esteem it a favour if correspondents, when forwarding logs to me for my perusal, would always be careful to state the number and description of the vehicles forming the train concerned, and also the tare tonnage, in order that I may check the figures given for gross tonnage, which I have not infrequently found to be somewhat wide of the mark. And in any case I trust that my friends will not, after studying this article, automatically add 20 per cent. to all tare loads of the trains in which they travel, because it is war-time, and quote me as the authority for doing so! My principal reason in penning the foregoing paragraphs has been to justify the tonnage figures given in recent and in the present issues, which have not by any means been the result of wild estimating, but have in all instances been computed with as much care as circumstances would allow.

Some months ago I undertook to describe some locomotive performance on the Highland Railway, and this promise I propose now to redeem, at a time of the year which may bring back to many who are for the moment less happily circumstanced the recollection of times in the past spent in the glorious country covered by that system. These runs were timed chiefly by friends who have been good enough to forward to me from time to time the results of their observations, and my only regret is that in all cases the details of maximum and minimum speeds, which add so greatly to the interest of running over a main line of grading such as this, are lacking from the records.



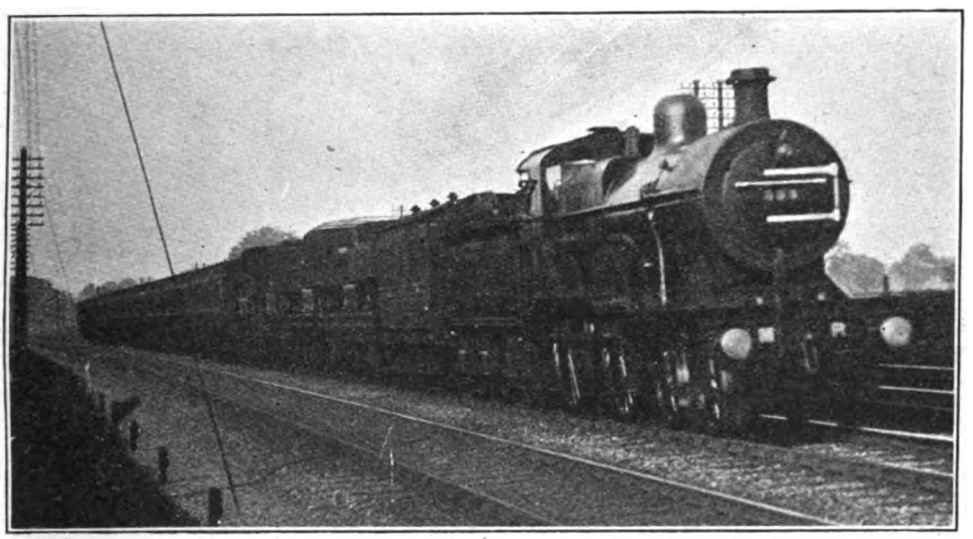
Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

Up express passing Biggleswade. 4-4-2 locomotive, No. 982, rebuilt with superheater. The passenger section of this train consists of a Gresley "twin" suburban set.

Digitized by Google

The Highland is a line whose average speeds suffer considerably from the adverse nature of the running conditions. Let us, first, consider the grading. Two miles out of Perth the initial ascent begins, at 1 in 188, and steepens finally to 1 in 93 at the summit near Murthly, 7 miles later. Sharp switchback grades, as steep in places as 1 in 80 for 2 miles, succeed to Moulinearn Crossing, 25½ miles out, after which we get Pitlochry bank, some 4½ miles long, of which two are at 1 in 85-90. But these are as nothing to *the* climb which commences a mile beyond Blair Atholl. This has an unbroken length of 17 miles, of which nearly 8 *continuously* are at 1 in 70, and just over 14 are steeper sea-level. From this point to Tomatin there is a fall of 3½ miles at 1 in 60; the next 6½ miles undulate with a falling tendency, and finally there is the tremendous 12 miles' descent to Inverness, 8½ miles of which are at 1 in 60, and a further 2¾ at 1 in 70. Such a road is hardly suited for express running, and in addition trouble is occasioned by considerable stretches of the line being of single track. At the same time, as I have previously pointed out in these columns, the passing places are so perfectly laid out, and the automatic arrangements for tablet-changing so efficient, that these passing points can be negotiated with the utmost smoothness at speeds even in excess of 50 m.p.h.



Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Up local train near Bedford. 4-4-0 rebuilt superheater engine, No. 538.

than 1 in 85! Of the initial 5½ miles' subsequent descent from Drumochter Summit —1,484 ft. above the sea, and the highest railway summit in the British Isles—3¾ are at 1 in 80, but the next 10¼ miles to Newtonmore have all slightly easier grading, only 5¼ of them being as steep as 1 in 100. After this there is an undulating stretch of 14½ miles to Aviemore, followed by a further arduous climb to Slochd Mhuic; out of a total of 12 miles, 2 miles at 1 in 150 and 1¾ at 1 in 75 occur in the first 4¾ miles, and then, after a sharply undulating 2⅛ miles to Carr Bridge, we have 2¾ miles up at 1 in 60, ¾ at 1 in 92, and 2 at 1 in 70 to the summit, 1,320 ft. above

The first of my correspondents' runs was with the old 3.50 p.m. *ex*-Perth, which at that time stopped only at Pitlochry, Blair Atholl, Newtonmore, Kingussie, and Aviemore to Inverness, instead of, as now, being non-stop to Dalnaspidal and calling at all stations thereafter. On this occasion the total train-load was 280 tons and the train engine—5 ft. 9 in. 4-6-0, No. 147, *Beaufort Castle* —was provided with a pilot, one of the early 4-4-0 "Loch" class, No. 122, *Loch Moy*. The two engines took things fairly easily, climbing to Stanley, 7¼ miles, in 11½ min.; the sharp 8¼ miles of undulations thence to Dunkeld occupied 12¾

Digitized by Google

min., and the subsequent 8 level miles to Ballinluig 10 min., Pitlochry, 28½ miles, being reached in 41 min., or 3 min. under schedule time. Whether my friend slept from this point, or was too engrossed, and justifiably so, with the scenery, his log does not reveal, but he next takes up his parable at Kingussie, whence a smart start-to-stop run was made to Aviemore, this 11¾ miles' length taking only 15¼ min., against 17 min. allowed. From Aviemore Carr Bridge, 6¾ miles, was passed in 12¼ min., and Slochd Summit, 12 miles, in 25 min.—speed up the 1 in 60-70, therefore, averaged 24.7 m.p.h.—and from the top to a signal stop at Daviot, 11¾ miles, occupied 14½ min. After 30 by signal at Strathord, before leaving Caledonian metals, and again at Dunkeld, this first 15½ miles thus taking 28 min. 40 sec. From Dunkeld we passed Ballinluig, 8 miles, in 12 min. 35 sec., Pitlochry, 13 miles, in 19 min. 35 sec., and Blair Atholl, 19¾ miles, in 31 min. On the climb to Drumochter speed fell on the 1 in 70 to 21 m.p.h., but then recovered to 25½, and further on the 1 in 85 to 27½ m.p.h., which represented really good work for an engine of this comparative antiquity; the total time for the 17¾ miles from Blair Atholl to the summit was 39 min. 40 sec. Bad signal checks were experienced at Inchlea Crossing and at Newtonmore on the subsequent descent,

Photo [*Tom M. L. Neish.*

HIGHLAND RAILWAY.

Perth to Inverness train in Newtonmore Station. 4-6-0 locomotive, No. 35, *Urquhart Castle.*

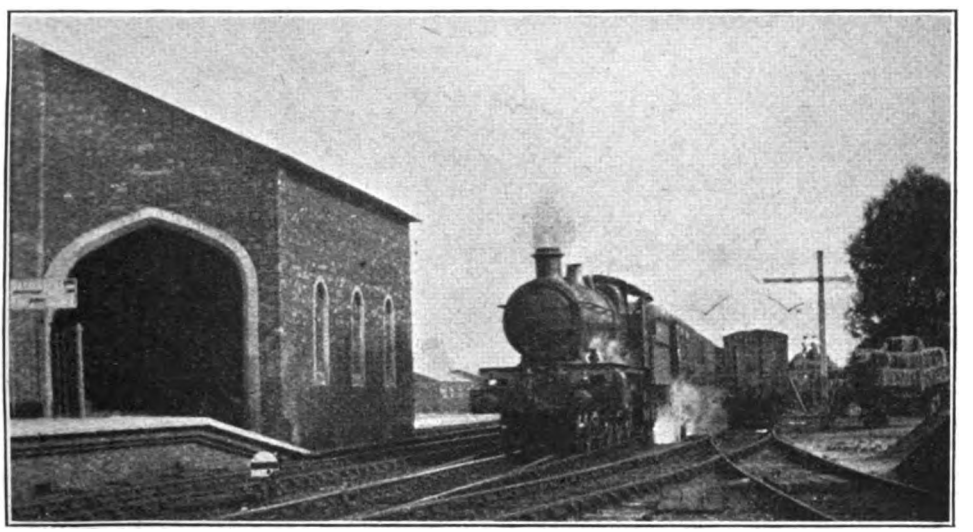
sec. standing, the remaining 11 miles down to Inverness were covered in 14¼ min., start-to-stop, making a total of 54¼ min. from Aviemore, 34¾ miles, or only 15 sec. over time.

In comparison with the earlier part of this journey, my most recent trip, on the "Strathpeffer Limited," which ran for one or two summers before the war, leaving Perth at 11.45 a.m., had some features of interest. The engine was another of the 4-4-0 "Loch" class—No. 123, *Loch-an-Dorb*—and the load 145 tons in all. Out of Perth we were stopped so that the 18½ miles from the summit to Kingussie occupied 25 min. 10 sec., and our total time from Perth, 71½ miles, was 5 sec. short of 126 min., but the net time probably did not exceed the 117 min. allowed. The Kingussie-Aviemore stretch was covered, start-to-stop, in 17¼ min., and at the latter station I alighted.

One of the finest Highland performances that has come under my notice was recorded by another friend, also on the 3.50 p.m. *ex*-Perth, and in this case between Aviemore and Inverness. The engine—No. 146, *Skibo Castle,* 4-6-0

Digitized by Google

type—tackled a load of 230 tons unaided, and completed the journey in 5 min. 50 sec. under schedule time, the total of 48 min. 10 sec. involving an average speed throughout of 43.3 m.p.h. Carr Bridge, 6¾ miles, was passed in 10 min. 35 sec., and Slochd Summit, 12 miles, in 23 min. 10 sec., the minimum speed on the 1¾ miles at 1 in 75 being 29 m.p.h., and on the final 1 in 60, 97 and 70 previously referred to 23, 28 and 27½ m.p.h. respectively. Without at any point exceeding 65 m.p.h., *Skibo Castle* then covered the 8 miles from Slochd to Moy in 8½ min., the 8 miles thence to Culloden in 8¾ min., and the last 6¾ miles into Inverness in 7¾ min., making a total of 25 min. for the 22¾ miles from the passing Culloden Moor, 6¾ miles, in 14 min. 40 sec.; Daviot, 11 miles, in 23¾ min.; Moy, 14¾ miles, in 31 min.; Tomatin, 19 miles, in 36½ min.; and Slochd Summit, 22¾ miles, in 44½ min. On the unbroken 1 in 60 between Culloden and Daviot an average rate of 29.8 m.p.h. was maintained—a fine achievement, even with this comparatively light load. The remaining 12 miles from Slochd to Aviemore were completed in 14 min., making a total from Inverness of 58½ min., or 3½ min. under schedule. *Taymouth Castle* took 15½ min. to Culloden, 25½ min. to Daviot, and was then stopped by signal at Moy in 33¾ min. from Inverness, being held for exactly 3 min. Restarting, No. 140 performed some



Photo] [*A. B. MacLeod.*

GREAT WESTERN RAILWAY.

Wolverhampton-Paddington (*via* Oxford) express approaching Culham.
4-cylinder 4-6-0 locomotive, No. 4055, *Princess Sophia.*

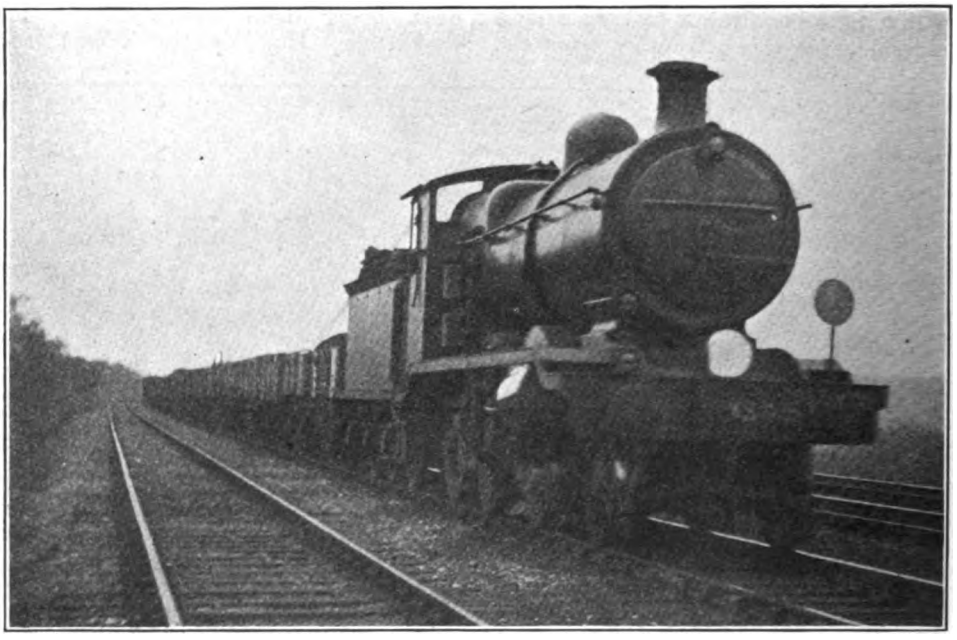
summit. This was in every way a meritorious piece of work.

In the south-bound direction there are, first of all, two runs out of Inverness, one on the late 8.40 a.m. train, allowed exactly 1 hour to Aviemore, and the other on the 3.50 p.m. sleeping-car express to the South (now 3.30 p.m.), which had 2 min. more for this initial run. On the former occasion the engine was 4-6-0, No. 140, *Taymouth Castle,* with 170 tons, and on the latter, No. 149, *Duncraig Castle,* of the same type, with 175 tons. The latter engine performed much the finer work, improved climbing work to the summit, this 8 miles' stretch taking only 14½ min., of which the 3¾ miles at 1 in 60 from Tomatin were covered at an average of exactly 29 m.p.h. From Slochd to Aviemore on this occasion took 13¾ min., making a total of 28¼ min. from Moy, 20 miles, and 65 min., or 61 min. net, from Inverness.

At Aviemore *Taymouth Castle,* on the morning train, attached an extra coach, bringing the load to 195 tons, and also a pilot of the "Loch" class, the two engines then making a very smart run to

Digitized by Google

Kingussie, of 11¾ miles in 14 min. 20 sec., instead of the 18 min. allowed. *Duncraig Castle,* with 175 tons, unpiloted, also did well to complete this run in 15¾ min. From Kingussie the piloted train adhered closely to schedule time as far as Drumochter Summit, passing Newtonmore, 2¾ miles, in 4½ min.; Dalwhinnie, 13 miles, in 20¾ min.; and Drumochter, 18½ miles, in 31½ min.; thence the 17¾ miles down to Blair Atholl were run in most leisurely fashion in 21½ min., making a total of 53 min. from Kingussie. Schedule for this 36¼ miles' distance was 54 min. *Taymouth Castle* took 5¼ min. 35¼ miles was covered in 44 min., start-to-stop, or 7 min. under schedule time. Pitlochry, 6¾ miles, was passed in 9¼ min., and the 8¼ miles thence to Dalguise occupied only 8½ min.; Dunkeld, 19¾ miles, was breasted in 24 min.; and Stanley Junction, 28 miles, in 35 min. 20 sec. On the run with the afternoon express there was a stop at Pitlochry, this point being reached in 10¼ min. from Blair Atholl. From Pitlochry, with a sharply falling start, *Duncraig Castle* passed Ballinluig, 5 miles, in 6 min.; Dalguise, 8¼ miles, in 9½ min.; and Dunkeld, 13 miles, in 16 min.; from that



Photo] [*P. S. A. Berridge.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Up fast goods train. 2-6-0 locomotive, No. 345.

to Newtonmore, 23½ min. to Dalwhinnie, and 35 min. to Drumochter, and then ran rather faster than usual down to Blair Atholl, covering this remaining distance in 19¾ min., of which the 11¼ miles from Dalnaspidal to Struan occupied only 11¾ min. Total time from Kingussie was on this run 54¾ min., against 58 min. booked.

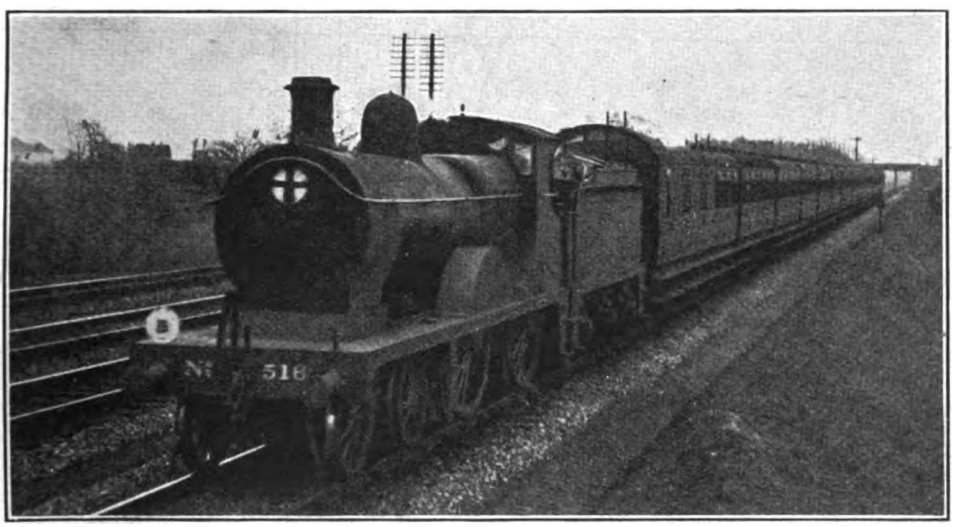
From Blair Atholl *Taymouth Castle* ran smartly into Perth, seeing that 28 miles of this distance are over single line, and a very severe slack has to be made at Stanley Junction; this stretch of point forward my friend's log is blank until the arrival at Perth in 37½ min. from Pitlochry, a distance of 28½ miles. Faster running was made on the same train on a subsequent occasion by the same engine with a load of 250 tons, but on the latter occasion a pilot was provided in the shape of an early 4-4-0—No. 92, *Strathdearn.* Pitlochry was reached in 9 min. 50 sec., and from the second start Ballinluig was passed in 5 min. 58 sec.; Dalguise in 9 min. 23 sec.; Dunkeld in 15 min. 53 sec.; Murthly, 18¼ miles, in 22 min. 12 sec.; Stanley Junction, 21¼ miles, in 26 min.

Digitized by Google

20 sec.; and Luncarty, 24¼ miles, in 29 min. 58 sec.; Perth was reached in 35 min. 5 sec., or nearly 5 min. under the 40 min. allowed.

My most recent south-bound run was with the same train, but the load was far heavier, totalling as it did 48 axles, or 335 tons, and on this occasion our train engine—No. 27, *Thurso Castle*—was only piloted from Aviemore as far as Dalnaspidal by the small Drummond "Ben" class 4-4-0 No. 11, *Ben Macdhui*. From Aviemore to Kingussie occupied 16 min. 55 sec., with a maximum of 58 m.p.h.; out of Kingussie we passed Newtonmore in 5 min. 50 sec., Dalwhinnie in 23¼ min., Drumochter in 34¾ min., and reached Ballinluig in 6 min. 40 sec., Dalguise in 10¾ min., and Dunkeld in 17 min. 10 sec., with a maximum of 56½ m.p.h., but the 2⅛ miles at 1 in 80 to Kingswood Tunnel reduced our speed to 26½ m.p.h., and so we took 25 min. 5 sec. to Murthly, 29½ min. to Stanley (where we slacked twice very severely), 33½ min. to Strathord, and 39½ min. into Perth, again pulling up very slowly. Our running throughout this journey was in close adherence to schedule time, and the work of the unpiloted engine over such a road with this heavy train was praiseworthy.

I must now hasten on to those London and North Western runs to which I have referred previously, and most of which



Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Up slow train on main line near Orpington. 4-4-0 locomotive, No. 516.

Dalnaspidal, 20½ miles, in 37 min. 10 sec. On the 2½ miles' ascent at 1 in 95 from Newtonmore we fell to 30 m.p.h.; on the easier succeeding grades to Dalwhinnie a recovery to 41½ m.p.h. was noted, while the final two stretches at 1 in 80, 2½ and ¼ miles long respectively, produced minima of 26 and 29 m.p.h. From Dalnaspidal we ran very cautiously down to Blair Atholl, 15¾ miles, in 20¾ min., never touching 60 m.p.h., and from there to Pitlochry in 11 min. 5 sec., stopping very slowly in each case in order to draw the long train to the platform. From Pitlochry we started excellently, passing

were made on quite recent journeys to and from Wolverhampton. On three occasions I travelled down by the 3.50 p.m. *ex*-Euston, the tare load to Rugby in each case being 411 tons, and the gross load, as nearly as I could estimate, 450-460 tons, the train being well filled, although not crammed. In each case our engine was of the 4-6-0 superheater "Prince of Wales" type, on the first run No. 1084, *Shark*, and on the second and third, No. 849, *Arethusa*. On the first occasion, despite the ascent of Camden bank and the now chronic p.w. slowing past Chalk Farm, we did well to Willes-

Digitized by Google

den, passing this point, 5⅜ miles, in 11 min. 5 sec.; on the other runs 11¾ min. and 12 min. 10 sec. were the times. Maximum speeds before Sudbury were 50½, 49½, and 49 m.p.h., and minima beyond Pinner 43½, 40, and 41½ m.p.h. respectively, but *Arethusa* did decidedly the better work up to Tring, falling only from 50 at Watford to a sustained 47½ m.p.h. at the summit (good work this with over 450 tons on 8½ miles at 1 in 330, in addition to other easier grades) on her first journey, and from 54 to 43 m.p.h. on her second, whereas the speed in *Shark's* case dropped from 54 to 39 m.p.h. So, reverting to the original order of the runs, we made times of 18¾ min., 19 min. 50 sec., and 20 min. were 14¾ min., 14¾ min. (the correspondence of these times, in view of the higher downhill speed on the first run, is due to the difference in the speeds on passing Tring), and 15 min. 35 sec.; and from Bletchley to Wolverton, where in each case a p.w. slowing was in force, 5¾ miles, 5 min. 50 sec., 6 min., and 6 min. 10 sec. The ascending 7⅜ miles thence to Roade occupied 9¾ min., 9½ min., and 9 min. 25 sec., with minimum speeds on the 1 in 330-335 of 42, 41½, and 43½ m.p.h., while the remaining 3 miles to Blisworth stop took 4¼ min., 4 min. 50 sec., and 4½ min., *Shark* making much the smartest stop. Total times from London for this 62¾ miles were, therefore, 80 min. 35 sec., 81¼ min., and

Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY.

4-4-0 locomotive, No. 437. *Charles Stuart Wortley*, at Ardwick.

to Harrow, 11⅜ miles; 26¾ min., 28¼ min., and 28 min. 5 sec. to Watford, 17½ miles; 35 min. 35 sec., 37 min. 5 sec., and 36¾ min. to Boxmoor, 24½ miles; and 46 min., 46 min. 10 sec., and 46 min. to Tring, 31⅝ miles, the times having thus drawn practically level.

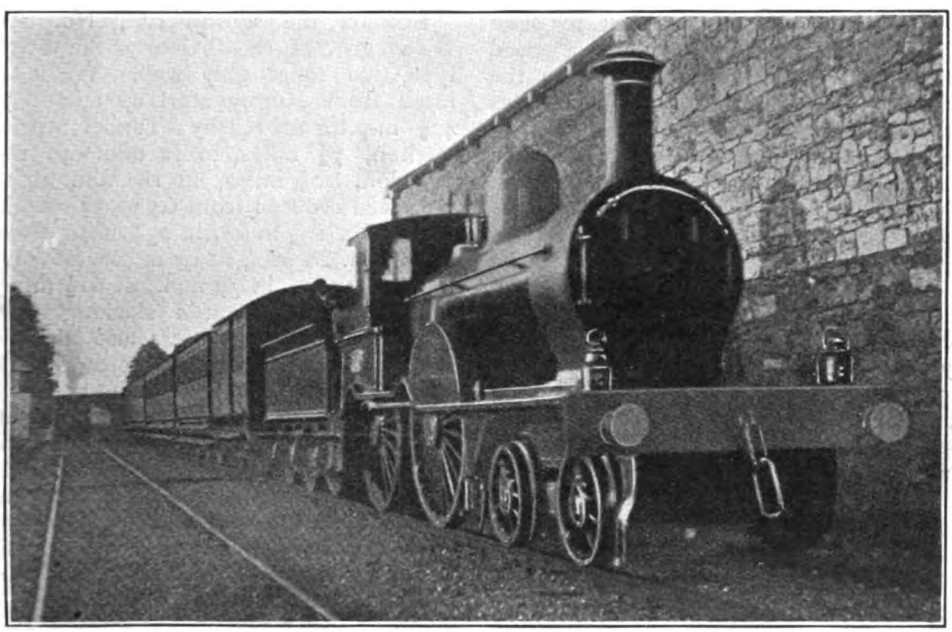
From Tring the fastest running was on the first journey, with a maximum rate of 67 m.p.h. still sustained to 64 at Bletchley, and 62½ on the faint rise beyond; on the second trip these figures were only 66, 61½, and 57 m.p.h., while on the third we shut off steam after attaining the mile-a-minute rate, and never exceeded it subsequently. So the times from Tring to Bletchley, 15 miles, 81 min. 40 sec., but these excesses over the 78 min. booking are probably more than compensated for by the two delays encountered en route, to the extent, at any rate, of at least 3 min.

As regards the somewhat sharp allowance of 26 min. for the 19⅞ miles from Blisworth to Rugby, we practically observed it on the first and second journeys, as we passed Weedon, 6¾ miles, in 9 min. 55 sec. and 10 min. 5 sec. (at the newly prescribed maximum rate of 50 m.p.h.); Welton, 12½ miles, in 17¼ min. and 16 min. 40 sec. (minima on the ascent to Kilsby Tunnel were 43 and 49½ m.p.h. respectively), and reached Rugby, after some very moderate down-

Digitized by Google

hill running, due in part, I believe, to signal checks, in 26 min. 35 sec. and 26¼ min. *Arethusa* on the third run was pulled up at Weedon, on account of a door in the train being open, and ran from there to Rugby, 13¼ miles, in 19 min. 40 sec. start-to-stop.

Over the remainder of the journeys it is well to draw a veil. One cannot help thinking that the L. and N.W. Company has carried the deceleration of these "Black Country" trains rather beyond the limit justified even by the present conditions when every so-called "express" is allowed an average of 1¾ hours between arrival at Rugby and arrival at Wolverhampton, a distance of 42 miles. On only one journey—the first trip with *Arethusa*—was any really smart running in evidence. On this occasion, with load reduced to 220 tons (192 tons tare), we ran from Rugby to Coventry, 11⅜ miles, in 14 min. 5 sec. start-to-stop, sustaining a speed of 68 m.p.h. beyond Brandon, and then again from Coventry passed Hampton, 9 miles, in 12 min., at 67 m.p.h. But with 30 min. allowed for the 19 miles from Coventry to Birmingham, it was after this a matter of running with steam shut off until our rate had dropped below 45 m.p.h.! This seems to me a wholly unnecessary proceeding, as obviously the temptation to any driver working through is to run easily over the earlier stages of the journey, and to make up any arrears of time on the unduly "slack" bookings of the concluding lengths, after his load has been reduced by one-half. Even on the last run, when we left Rugby 18½ min. late, in consequence of the extra stop at Weedon and other delays, with the most moderate performance we reached Wolverhampton on time, running from Rugby to Coventry in 15 min. 20 sec., Coventry to Birmingham in 25 min. 55 sec., Birmingham to Dudley Port in 14 min. 20 sec. (7¼ miles), and Dudley Port to Wolverhampton in 10 min. 25 sec. (6¾ miles). Schedule times for these sections are 16, 30, 15, and 14 min. respectively, the remaining 10 min. being economised on the stops.



Photo] [*J. Macartney Robbins.*

GREAT SOUTHERN AND WESTERN RAILWAY.

Macdonnell 4-4-0 locomotive, No. 60, on Waterford trains at Abbeyleix.

The last previous run I had on the 3.50 p.m. *ex*-Euston was when it started 5 min. later, and ran non-stop to Northampton in 79 min., but this was somewhat disappointing, as a 4-6-0 4-cylinder "Claughton"—No. 1329, *Alfred Fletcher*

Digitized by Google

—lost 2½ min. with a load of 62 axles, 421 tons empty, and 460 tons full. We slacked past Camden, and breasted Willesden in 13½ min.; rose to 49 m.p.h. before Sudbury, and fell to 43 beyond Pinner; we then accelerated again to 52½ m.p.h. at Watford, falling thereafter gradually to 48 m.p.h. at Tring. So we passed Harrow in 21 min. 25 sec., Watford in 29 min. 10 sec., Boxmoor in 37 min. 25 sec., and Tring in 46¼ min. From Tring to Bletchley took 14 min. 5 sec., with a maximum of 67 m.p.h.; from Bletchley to Wolverton 5¼ min., with a minimum of 65 m.p.h. and a renewed maximum of 67; and from Wolverton at Roade, including a bad slack to cross over from fast to slow roads, 8 min. 25 sec. The lowest speed on the ascent before the slack was the good one of 51 m.p.h. The final 6 miles into Northampton took 7⅛ min., making 81½ min. in all for the 65¾ miles from Euston, or 79 min. net. Not really a bad effort, I suppose, in view of the load.

For the present, owing to lack of space, I will leave over the description of a couple of down runs on the 9.10 a.m. and 1 p.m. "Scotsmen," with their complementary up journeys, and will confine myself to a brief description of two return runs from Birmingham on the 2.5 p.m. train. On the first a "Renown" class converted compound 4-4-0, with 220 tons, ran from Birmingham to Coventry in 26 min. 10 sec., and thence to Rugby in 18 min., thus losing slightly on schedule. But on the second occasion a 4-4-0 superheater "George the Fifth" type engine ran much more smartly with a 49-axle load of 345 tons, passing Stechford, 3½ miles, in 7 min. 5 sec.; Hampton, 9¾ miles, in 13 min. 35 sec. at 60 m.p.h.; Tile Hill, 15 miles, in 19 min. 40 sec., at 51 m.p.h., and reaching Coventry in 24 min. 10 sec. From Coventry, with 235 tons, we ran to Birmingham in 15½ min., the engine having thus gained in all 3 min. 20 sec.

At Rugby, after combination with the 12.5 p.m. express *ex*-Manchester, our load became a formidable one, 60 axles, or 409 tons tare, on the first occasion, and 64 axles, or 431 tons, on the second. The train was very well filled on both runs, and, being almost entirely non-corridor, the gross loads could have been but little short of 460 and 480 tons respectively. On the first occasion a 4-4-0 non-superheater "Precursor" found 460 tons rather too onerous a task of haulage, and, suffering a bad signal check at Weedon, took 35 min. 10 sec. to Roade, 22⅞ miles; 49 min. 40 sec. to Bletchley, 36 miles; 69 min. 40 sec. to Tring, 51 miles, and 98 min. to Willesden, 77 miles. A net time of 95 min. showed a loss of 1 min. on schedule.

But on the second run, No. 1799, *Woodcock*, of the "George the Fifth" type, did thoroughly well. We accelerated from Rugby start up 1 in 364 to 42½ m.p.h. at Kilsby Tunnel; passed Welton, 7⅛ miles, in 12 min. 40 sec.; Weedon, 12⅞ miles, in 18 min. 20 sec. (at speed reduced from 64 to 55 m.p.h.); Blisworth, 19⅞ miles, in 25¾ min.; Roade, in 29 min. 20 sec., at 47 m.p.h.; Wolverton, 30¼ miles, in 37 min., at 61½ m.p.h., immediately afterwards slacking to 55 m.p.h. for bridge repairs; and Bletchley, in 43 min. 20 sec. From here to Tring the engine was slightly eased, but even then we covered the 6½ miles on to Leighton in 7 min. 20 sec., and the 8½ miles thence up to Tring Summit, where speed fell to 41½ m.p.h., in 11 min.—total, 61 min. 40 sec. from the start. From Tring down to Watford, 14⅛ miles, took 15 min., with a maximum of 62½ m.p.h.; from Watford to Sudbury, where we were doing 67 m.p.h., 9⅜ miles, 9 min. 5 sec., and the final 2¾ miles into Willesden, 3¼ min. That is to say, we had completed the journey from Rugby in exactly 89 min., or 87 min. net, 5 and 7 min. respectively inside schedule time. This may not have been a brilliant performance, as judged by pre-war standards, but it was nevertheless a pleasant experience in these days of slack times and sluggish running.

Digitized by Google

The Early History of the London, Brighton and South Coast Railway from its Inception to the End of 1847.

By H. H. MEIK.

Continued from August "Railway Magazine," page 97.

ON the main line the original stations were Croydon (now East Croydon), 1 mile 4 chains from the starting point; Godstone Road (now Purley), 3 miles 1 chain; Stoat's Nest (now represented by Coulsdon), 1 mile 68 chains; Merstham, 3 miles 54 chains; Redstone Hill or Reigate (now Red Hill), 1 mile 68 chains*; Horley, 4 miles 9 chains; Three Bridges, 3 miles 45 chains; Balcombe, 4 miles 45 chains; Haywards Heath, 3 miles 72 chains; Burgess Hill, 3 miles 56 chains; Hassocks Gate or Ditchling Gate, 2 miles 9 chains; and Brighton, 7 miles 6 chains.

On the Brighton and Shoreham line the original intermediate stations appear to have been; Hove (now Holland Park Goods Station), Portslade, and Southwick (these last two stations were situated some little distance to the east of the presen stations), and Kingston-on-Sea (now a goods station).

After leaving the junction with the Croydon Railway the line passed on the east side of Croydon and rose

LONDON AND BRIGHTON RAILWAY—BRIGHTON TERMINUS.
From an old woodcut.

* This station, according to the present Railway Clearing House maps, is situated 10 chains north of the junction of the South Eastern (Dover) line, but according to an Ordnance Survey map, published in 1816, and issued subsequent to 1849, Red Hill Station is shown as at about 40 chains south of the Dover Junction. This would appear to be the present goods station. The measurements refer to the present passenger station.

Digitized by Google

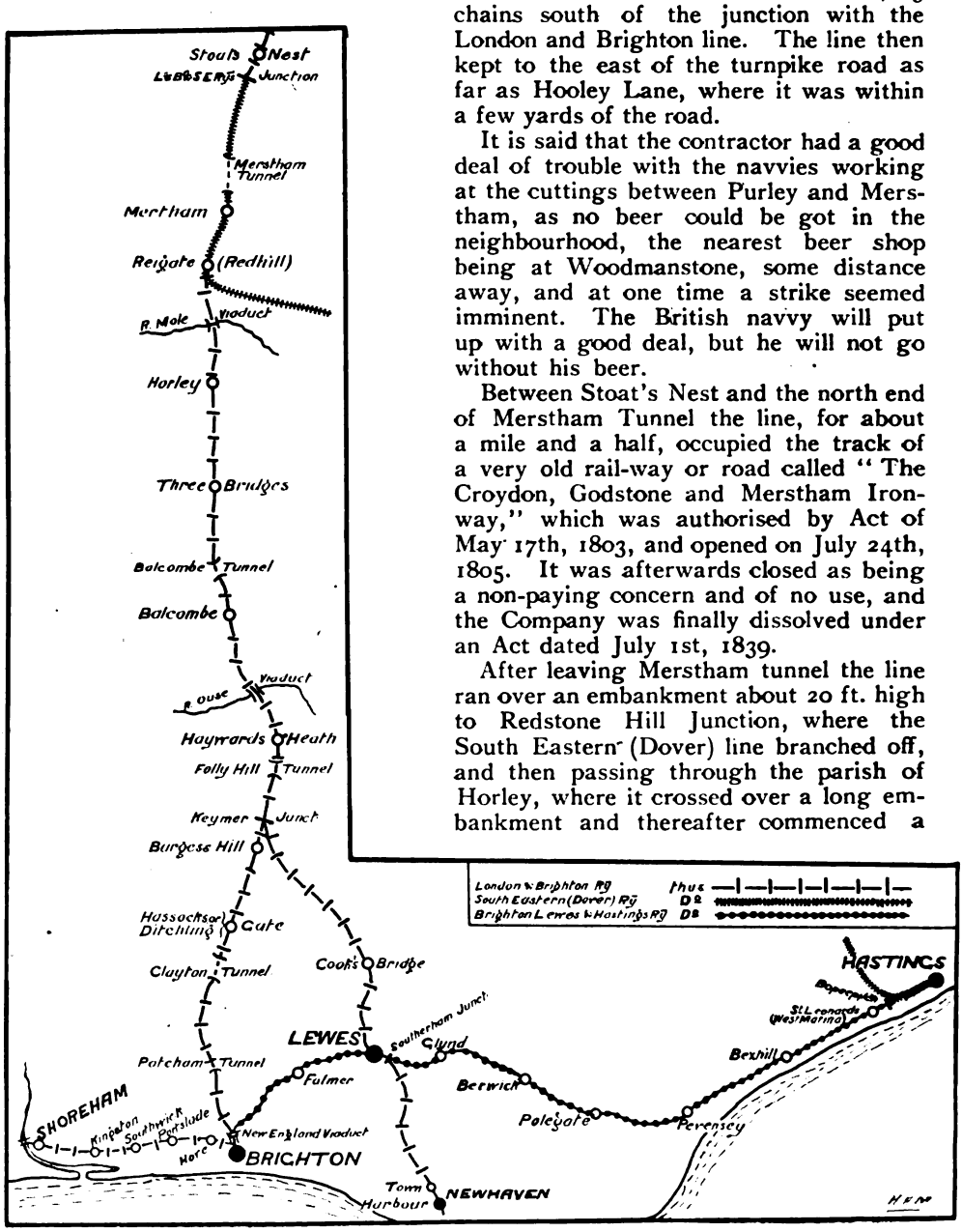
steadily for about 8 miles to Merstham. The next station, Godstone Road, consisted of a single platform, with a rough shed for passengers, and it would have appeared to have been a desolate spot when the line was opened, as there were only two houses, one of which was close to the old Toll Gate on the coach road, situated on the west side of the line. For some months after the opening the station had no name at all, and it was only after that time that it was decided to call it Godstone Road, the name being changed to Caterham Junction when the Caterham Valley branch was opened.

The line then passed Stoat's Nest Station, now represented by Coulsdon and Cane Hill Station, which is situated on the South Eastern section of the line, 15 chains south of the junction with the London and Brighton line. The line then kept to the east of the turnpike road as far as Hooley Lane, where it was within a few yards of the road.

It is said that the contractor had a good deal of trouble with the navvies working at the cuttings between Purley and Merstham, as no beer could be got in the neighbourhood, the nearest beer shop being at Woodmanstone, some distance away, and at one time a strike seemed imminent. The British navvy will put up with a good deal, but he will not go without his beer.

Between Stoat's Nest and the north end of Merstham Tunnel the line, for about a mile and a half, occupied the track of a very old rail-way or road called "The Croydon, Godstone and Merstham Ironway," which was authorised by Act of May 17th, 1803, and opened on July 24th, 1805. It was afterwards closed as being a non-paying concern and of no use, and the Company was finally dissolved under an Act dated July 1st, 1839.

After leaving Merstham tunnel the line ran over an embankment about 20 ft. high to Redstone Hill Junction, where the South Eastern (Dover) line branched off, and then passing through the parish of Horley, where it crossed over a long embankment and thereafter commenced a



Digitized by Google

descent to Balcombe, and then passed through Balcombe Tunnel; next it crossed over the Ouse Viaduct to Haywards Heath, after which the line passed through a short tunnel, 700 ft. long, and then through a cutting of nearly 2 miles long to an embankment across St. John's Common, before reaching Burgess Hill Station. Then the line traversed Clayton tunnel, and, running through the parishes of Patcham and Preston, arrived at the terminal station at Brighton, which was situated in Church Street.

The whole length of the line from the Croydon Junction to Brighton being 41 miles 26 chains, including the South Eastern section, between Stoat's Nest Junction and Redhill Junction, a distance of 5 miles 67 chains.

The Shoreham section of the line ran due west from Brighton, between which and the present Holland Park Goods Station is situated the New England tunnel, which passes under the now Prestonville and The Dyke Roads. West of Hove the line ran on a descending embankment to Shoreham.

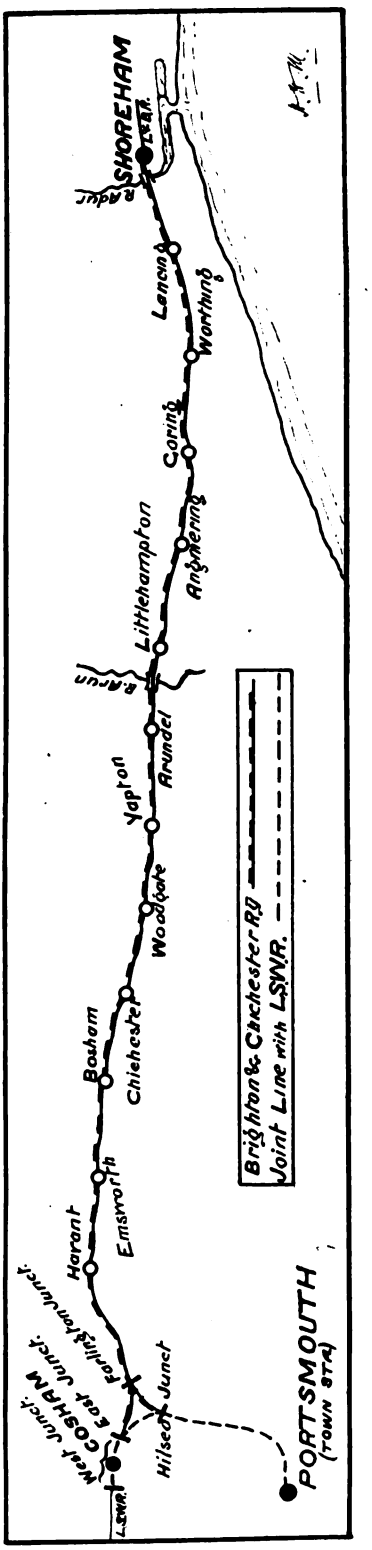
The ruling gradients were 1 in 264, and they occurred on each side of the Merstham, Balcombe, and Clayton tunnels, both on the main line and the Shoreham branch to near that station.

The earthworks were of a very heavy character, which worked out at the rate of 156,000 cubic yards per mile, excluding tunnels. The cutting at the north end of Merstham tunnel was the largest work of its kind, ranging from about 80 ft. to 120 ft. below the level of the ground at its deepest part, and consisted mostly of chalk, which was made into spoil.

The principal embankment was at Earlswood Common, south of Red Hill Junction, which was about three-quarters of a mile long and 45 ft. high at its apex. It was very expensive and difficult to construct, the material disappearing out of sight as fast as it was deposited. Another embankment was near Hassocks Gate (St. John's Common), and contained nearly a million cubic yards of earth.

Bridges over and under the line numbered 99, and were chiefly built of brick with stone dressings.

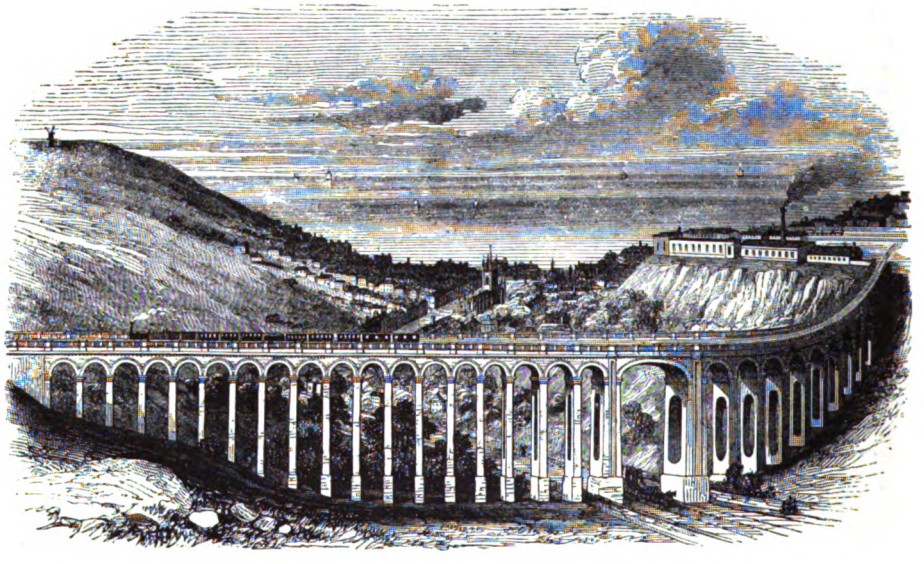
There were three principal viaducts: Firstly, the Vale Bridge Viaduct over the River Mole, between Red Hill and Horley, consisting of eight arches of



Digitized by Google

32 ft. span each; secondly, the Ouse Viaduct over the stream of that name, which consisted of 37 semi-circular brick arches, varying from 40 ft. at the abutments to 96 ft. at the point where it crosses the river; it was designed by Mr. Rastrick and is 1,476 ft. long. And, lastly, the New England Viaduct, lying on the west side of the present loco. works and running sheds, which consisted originally of three arches 45 ft. high, composed of brick and stone, the foundation-stone being laid with masonic honours on May 27th, 1839.

The principal tunnels were as follows: (1) Merstham, 1,826 yards long, which



THE BRIGHTON VIADUCT ACROSS THE PRESTON ROAD.
From an old woodcut.

took about three years to construct. It ran through the chalk strata, the material excavated being raised to the surface by means of vertical shafts and the contents deposited in spoil banks. When first opened the tunnel was whitewashed and lighted with gas. (2) Balcombe Tunnel, 1,122 yards long; (3) Folly Hill Tunnel, south of Haywards Heath, 297 yards long; (4) Clayton Tunnel, 2,288 yards long, the ventilating shaft of which tops the highest point of the hill and can be seen for miles around; and (5) Patcham Tunnel, 583 yards in length, which was called the "Compulsory Tunnel," as Major Payne, the proprietor of the property under which the line runs, compelled the company to make a tunnel instead of an open cutting, and a clause to that effect was inserted in the Act of Parliament authorising the line.

Originally the rails were 4 ft. 9 in. apart, in order to allow sufficient play for the wheels. The intermediate space was 6 ft. 5 in. (now usually called "the six foot way"). The rails were in 15 ft. lengths of the double parallel form, weighing 76 lb. to the yard. The chairs were fixed partly on cross sleepers and partly on stone blocks, felt being introduced between the chairs and the stone.

As far as the writer can discover, the first locomotives supplied to the company were constructed between 1839-1841 by Sharp, Roberts, and Co. They were 16 in number, and all were six-wheel engines with 5 ft. 6 in. single drivers. Two, called *Venus* and *Jupiter*, had cylinders 12 in. dia. by 18 in. stroke; all the rest had cylinders 14 in. dia. by 18 in. stroke. They were called *Merstham*, *Coulsdon*, *Mars*, *Saturn*, *Mercury*, *Orion*, and *Sirius*. The remaining seven do not appear to have been named. Their engine numbers ran from 16 to 22 inclusive. Two others, named *Brighton* and *Shoreham*, were constructed by G. and J. Rennie in 1840, the size of the driving wheels and

Digitized by Google

cylinders being the same as those immediately above mentioned.

On the Brighton and Shoreham branch there were in May, 1840, six trains each way on week-days and five on Sundays, beginning with the 9.0 a.m. from Brighton, and the 10.0 a.m. from Shoreham on both week-days and Sundays. The last train from Brighton was the 7.0 p.m. on week-days and the 8.0 p.m. on Sundays. From Shoreham the last train was the 8.0 p.m. on week-days and the 9.0 p.m. on Sundays.

The single fares were: First class, 1s.; second class, 9d.; and third class, 6d. A first class coupé was 1s. 4d.

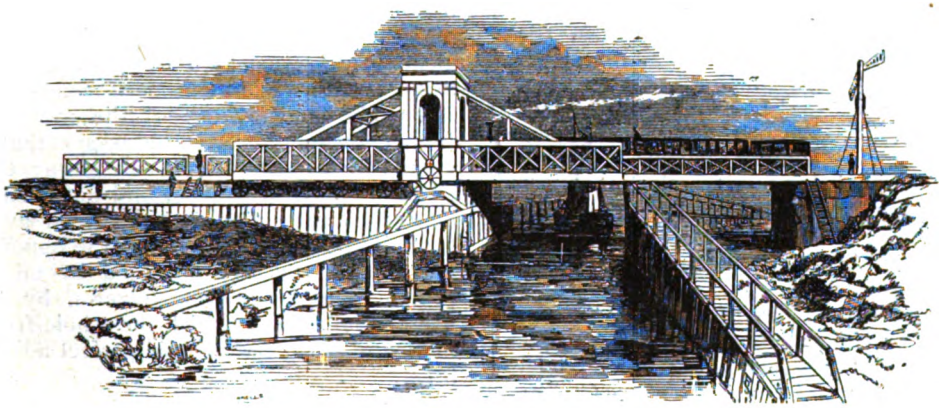
On the London and Brighton main line in 1841 there were from London on week-days mixed trains, consisting of first and second class carriages, at 9.45 a.m.; 1.45, and 2.45, also (to Croydon only) 7.0 p.m. First class trains at 10.45 a.m. and 3.45 p.m. Express train 4.45 p.m. On Sundays, mixed trains at 8.0 and 10.45 a.m. and 7.0 p.m., also (Croydon only) 10.0 p.m.

From Brighton there were on week-days 6.45 and 11.45 a.m. and 4 p.m., also (from Croydon only) 4.0 p.m. First class trains at 10.45 a.m. and 2.15 p.m., express train 8.30 a.m.; Sundays, mixed trains at 7.45 a.m. and 4.0 and 7.0 p.m.

In August, 1842, there were eight down trains on week-days, six of which were mixed trains, stopping at all stations, which took two and a half hours for the journey, and one mail and one first class train, which took two hours for the journey and stopped at Croydon, Red Hill, Three Bridges, and Haywards Heath only. There was also a mixed train at 7.45 a.m., which carried third class passengers. Two other mixed trains went as far as Croydon only. On Sundays there were three mixed trains, stopping at all stations to Brighton, and one to Croydon only.

On the up journey there were from Brighton the like number of mixed trains stopping at all stations, and one mixed and one first class train that stopped at Haywards Heath, Three Bridges, Red Hill, and Croydon only. The last up mixed train carried third class passengers. On Sundays there were three mixed trains stopping at all stations, and one from Croydon only. The fares (single) were 14s. 6d. first class, 9s. 6d. second class, and 6s. third class.

The mileage was reckoned as 50½ miles from London Bridge.



RAILWAY DRAWBRIDGE OVER THE RIVER ARUN, CALLED "THE TELESCOPE BRIDGE."

From an old print showing the bridge closed.

Shoreham, Chichester, Havant, Cosham, and Portsmouth Line.

At a meeting held by the London and Brighton Company on February 7th, 1844, the Directors were authorised "to take a lease at 4 per cent. per annum of the proposed branch line from Shoreham to Chichester," which was afterwards incorporated by Act dated July 4th, 1844 (788 Vict. cap. 67), under the name of "The Brighton and Chichester Railway Company," for the construction of a line

Digitized by Google

from Shoreham to Chichester, and included in the Act power was taken to sell the line to the London and Brighton Company. This was effected in 1845 at a premium of £12 10s. per share of £50 on 4,520 shares, amounting to £56,500.

Under an Act dated August 8th, 1845 (8 and 9 Vict. cap. 199) the Brighton and Chichester Company procured powers to make an extension to Havant, Portsmouth, and Cosham, and to sell that extension to the London and Brighton Company when completed. Although this extension could not be legally transferred until completed, the existence of the Brighton and Chichester Company was merely nominal, the works being carried on and the money found by the Brighton Company.

The line was opened as follows, viz.: To Worthing on November 24th, 1845; to Arundel (now called Ford Junction) on March 16th; to Chichester on June 8th, 1846; to Havant on March 15th; and to Portsmouth (Town Station)* and Cosham on June 14th, 1847.

By an Act of 1847, intituled "The Brighton and Chichester (Portsmouth extension) and London and South-Western Railways Act," that section of the line extending from a point 5 chains west of Cosham Station to Portsmouth via Portcreek or Hilsea Junction and Fratton, was made joint between the two companies, the London and South Western Company paying £60,000 for their share.

After leaving Shoreham Station the line crossed the Adur by a viaduct 550 yards in length, and then practically ran parallel with the coast line, passing through Lancing, Worthing, Goring, and Angmering Stations to the erstwhile station of Littlehampton.†

The next point of notice was the drawbridge across the River Arun, which had to be constructed to meet the requirements of the Lords of the Admiralty, who had, and perhaps still have, the jurisdiction of the River Arun. They demanded that the bridge should be capable, when open, of leaving a clear space of 60 ft. for the passage of vessels navigating the river. This drawbridge was of a larger opening by many feet than any such like bridge which had been constructed up to that date. The bridge, with the exception of the machinery moving it, was constructed entirely of timber, and consisted of two strongly-trussed frames or platforms, one of which moved laterally or sideways, the other, or principal, trussed framing moved back to the extent of 63 ft. when the bridge was open and occupied the space vacated by the first mentioned moveable platform.

The principal trussed moveable framing was 144 ft. long and 35 ft. high and weighed about 70 tons. It was supported by fourteen friction wheels of 6 ft. in diameter, and was easily moved on a fixed rack underneath the bridge, and was readily opened by two men and a boy in about 4 or 5 minutes. The total length of the bridge was 273 ft. and the clear width was 12 ft. It was constructed for a single line of rails only. From the great lengh of the moveable timber framing it was necessary that it should be supported in such a way that it would retain its shape, and not become depressed at the end when drawn away from its point of support on the opposite pier. This was accomplished by means of slings and adjusting screws, by the use of the latter of which the whole framing could always be kept in perfect adjustment.

The strength of the work was severely tested by Major-General Pasley and Colonel Codrington, the Inspectors-General of Railways, who expressed themselves perfectly satisfied with the result. The bridge was designed by Mr. Rastrick, and the contractor for the work was Mr. Butt, of Littlehampton.*

After crossing the Arun the line runs practically due west through the Cathedral City of Chichester to Havant.

The original stations on the line, commencing at Brighton, were, as far as the writer has been able to discover, as follows, viz.: Shoreham, Lancing, Worthing, Goring, Angmering, Littlehampton (station now abolished), Arundel (now called Ford Junction), Yapton (now abolished), Woodgate (now abolished, Drayton Station being used in its place), Chichester, Bosham, Emsworth, Havant, and Portsmouth (Town Station).

* The Portsmouth Town and Harbour Extension was not opened till October 2nd, 1876, and the Southsea Branch until July 1st, 1885.

† This station was closed on August 17th, 1863, when the branch to Littlehampton village was opened.

* This bridge has been replaced by a more modern structure.

Digitized by Google

According to the time-tables for March, 1847, the trains were as follows, viz. :—

From Brighton to Havant there were two morning and five afternoon trains. Of these four took 1 hour 55 min., two took 2 hours, and one 2 hours 10 min. for the journey.

From Havant to Brighton there were four morning and three afternoon trains, the times varying between 1 hour 50 min. and 2 hours 25 min. for the journey.

Brighton, Lewes, and Hastings Line.

This company was originally projected as a separate concern for a line from Brighton via Lewes and Polegate to St. Leonards and Hastings, but at a meeting of the London and Brighton Company held on February 7th, 1844, the Directors were authorised "to take a lease at 4 per cent. per annum of the proposed branch line from Brighton to Hastings." The Company, which was incorporated by Act dated July 29th, 1844, with an authorised capital of £425,000 and loans to the extent of £140,000, was purchased by the Brighton Company in August, 1845, at a premium of £7 per £50 share, which involved an addition to the cost of construction of £35,000.

At the half-yearly meeting held at London Bridge Station on February 24th, 1845 (William Nash, Esq., in the chair), the report stated that an arrangement had been completed with the Brighton Company, who were the registered proprietors of 3,500 shares.

The Engineer to the line (Mr. Rastrick) reported to the meeting that between Brighton and Lewes, where the heaviest works were encountered, great progress had been made, particularly on each side of the Falmer Tunnel; between Falmer and Brighton five occupation bridges had been built, and the public road bridge and the viaduct over the London, or Preston, Road was soon to be put in hand.

The line branches off from the London and Brighton line 20 chains north of Brighton Station and immediately after crossing the New England Viaduct before referred to. It then crossed the London or Preston Road by a viaduct consisting of an elliptical arch of 50 ft. span and 73 ft. high, flanked on one side by 18 and on the other by nine semi-circular arches of 30 ft. span each; the former were built on a curve of 60 chains radius and the latter on a curve of 10 chains radius. They are of the same height throughout and finished by a bold cornice and handsome balustrades. The length of the viaduct is 400 yards, and ten million bricks were used in its construction. In consequence of it being on the curve one side is 40 ft. longer than the other. All the arches radiate towards the centre of the curve, and the piers are 1 ft. 8 in. thicker at one end than the other, in order to have the openings parallel. General Pasley, the Government Inspector, at the inspection expressed himself highly satisfied with the work. The first stone was laid by the Chairman of the Company on May 28th, 1845, and the last arch was keyed in on March 28th, 1846.

After crossing the viaduct the line passes through a short tunnel of about 60 yards under the Ditchling Road, with a deep chalk cutting (Rose Hill Cutting) on either side. The contractor's method with regard to excavating these cuttings was to bore a heading at the level of the line through the cutting, and then sink four shafts into the heading from the top at about 18 or 20 ft. apart, down which the chalk poured into wagons placed at the bottom. Just beyond the cutting the line ran under the Hollingdean, which forms the northern boundary of the parish of Brighton. After passing through another cutting the line runs along the side of the hill at the back of the Cavalry barracks, and then through a deep cutting to Hodsgrove, where the Lewes turnpike road is crossed by a skew bridge of three arches, each of 60 ft. span and wholly built of brick. From this point the line, which hitherto lay on the west side of the Lewes Road, lies entirely on the eastern side. Next an embankment and deep cutting follow, and then a long embankment, which skirted Stanmer Park, the seat of the Earl of Chichester.

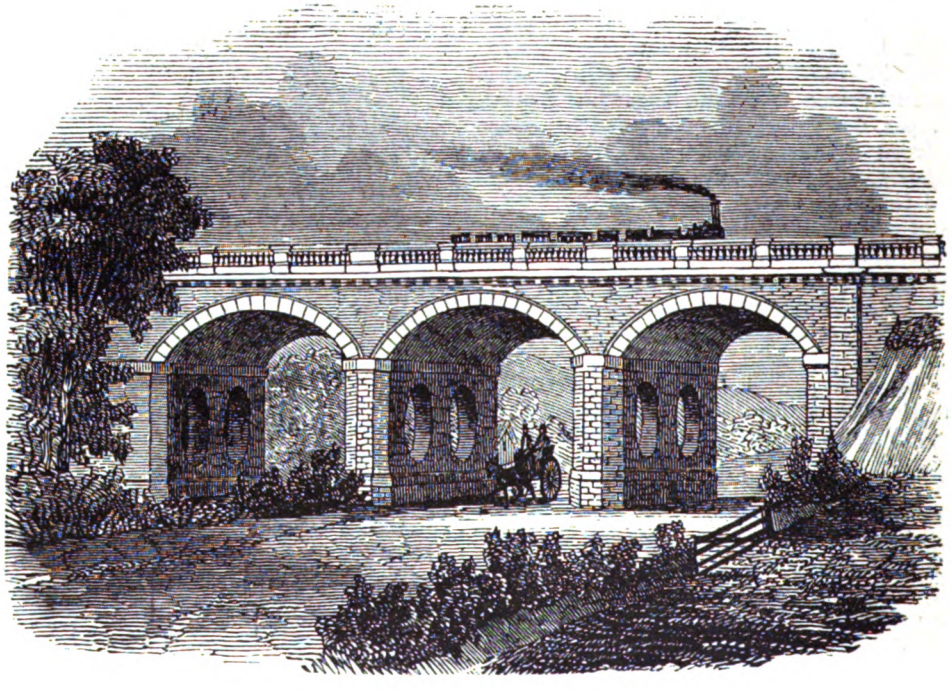
At the south-east end of the park Falmer Station is situated, and at the foot of Falmer Hill a cutting commences; then comes a tunnel 500 yards long under the village of Falmer, next there is a long, deep cutting, and then a shorter one. After this the line runs through open country to the foot of Watershoot Hill, where it crosses the Winterbourne stream and then, passing through a short tunnel, enters Southover, and then, running under

Digitized by Google

the Lewes and Newhaven Road and crossing the Priory grounds, reaches Lewes Station in the High Street at the foot of School Hill.

On the completion of the line it was inspected by General Pasley on June 3rd, 1846, and, having been certified by him, was opened for traffic on June 8th thereafter—a distance of 7 miles 76 chains—the event being celebrated at Lewes by a general holiday. The only station on the line was Falmer, above mentioned.

The section between Lewes and Hastings, or, rather, Bopeep Junction, 15 chains east of West Marina Station, was



THE HODSHROVE SKEW BRIDGE.
From an old woodcut.

26 miles 41 chains long, and was opened on June 27th, 1846, as far as Bulverhythe, which would appear to have been situated somewhat to the west of the West Marina Station. When the South Eastern line was opened from Tunbridge Wells to St. Leonards (Warrior Square) and Hastings on February 1st, 1852, the London and Brighton Company extended their line from Bulverhythe to Bopeep Junction, and so got an entrance into Hastings. The original terminus of the London and Brighton Company was to have been at St. Lenoards, but as the South-Eastern Company had procured their Bill for the line to Hastings, the London and Brighton Company came to an agreement with them whereby they procured admission into Hastings Station.

The original stations on the line were Glynde, Berwick, Pevensey, Bexhill, and St. Leonards (Warrior Square).

After leaving Lewes the line crossed the Ouse by a telescope bridge similar to that over the Arun at Arundel (now Ford Junction). It was 150 ft. long, 25 ft. broad between the parapets, and 28 ft. high from the river's bottom, while the chief opening for vessels was 36½ ft. wide. There were also three other spans, each of 30 ft. in width, and raised 35 ft. above the water. It was built of wood on brick foundations, and upwards of 20,000 cubic feet of timber and 24 tons of iron were used in its construction.

The line then crossed the Lewes and Eastbourne Road, along which for about the next 7 miles it keeps on the north side, crossing on its way the Glynde Brook.

Digitized by Google

After passing Glynde and Berwick stations it crosses the Cuckmere Burn, and about 3½ miles further on the Hailsham and Eastbourne Road, near Polegate, and, after crossing a second road from Hailsham to Eastbourne, at Stonecross, the shore is approached at Pevensey. From that point the line runs along the shore, which is flat and uninteresting, to Bexhill, 6¾ miles, and then to Bulverhythe, already referred to.

Keymer Junction and Lewes Branch.

This branch line to Lewes leaves the main line at the present Keymer Junction situated between Wivelsfield and Burgess Hill Stations. There would appear to have been, at one time, a station at or near Keymer Junction, situated on the Lewes branch, but it has since been abolished.

The Act for this branch was authorised by Act dated June 30th, 1845, and it was opened in October, 1847. It passes through an undulating and in some places hilly country to Cook's Bridge Station (the only other station on the line), and then proceeds on to Lewes, a distance of 9 miles 9 chains, the last mile of which runs along the valley of the Ouse.

Lewes and Newhaven Branch.

The Lewes and Newhaven branch actually starts from Southerham Junction, 61 chains east of Lewes, on the Hastings line, and is 5 miles 35 chains in length to Newhaven Town Station and 27 chains further to the Harbour Station. There is no intermediate stations. The line was authorised by Act dated June 18th, 1846, and opened on December 8th, 1847, and practically runs by the side of the Ouse River all the way.

Prior to the opening of the London and Brighton main line there had been a packet service between Brighton Old Chain Pier (washed away in December, 1896) and France, which was inaugurated in 1792, but after the Brighton and Shoreham line was opened in May, 1840, the packet service was transferred to Kingston-on-Sea, close by Shoreham, in July, 1842. In or about April, 1843, the General Steam Navigation Company entered into an arrangement with the London and Brighton Company to run first class steamers to Dieppe and Havre as soon as the Paris and Rouen line was opened. As, however, the London and Brighton Company and the General Steam Navigation Company could not come to an agreement between themselves the Brighton and Continental Steam Packet Company was formed and a new service was started from Brighton in 1847.

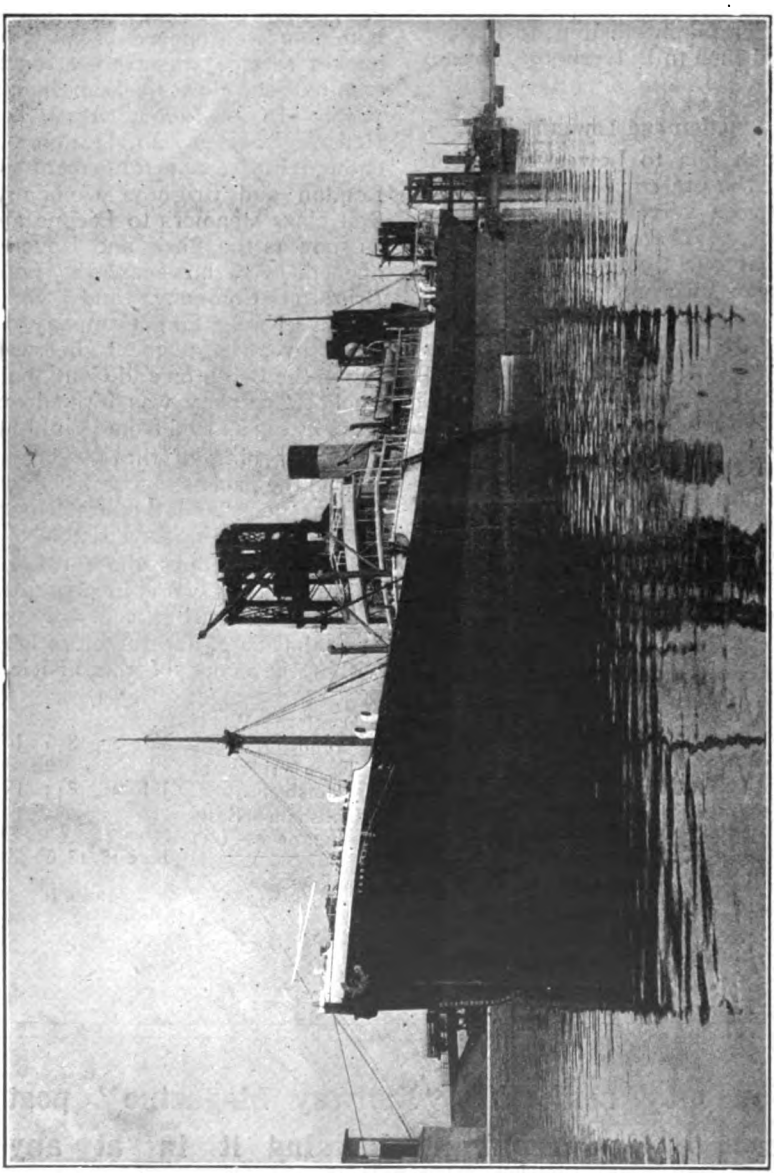
The opening of the Newhaven branch caused the packet service to be transferred to that port, and the first steamer commenced to run in May, 1849.

Besides the lines above referred to the following lines were incorporated before the end of 1847, but were not opened until after that date, and therefore hardly come within the scope of this article.

	Act.	Opening.
1. Deptford Wharf Branch	July 27, 1846	July 2, 1849
2. Three Bridges to Horsham... ...	July 21, 1845	Feb. 14, 1848
3. Hailsham to Eastbourne (via Polegate) ...	June 18, 1846	May 14, 1849

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

Digitized by Google



VESSELS LOADING COAL, ALEXANDRA DOCKS, NEWPORT.

Digitized by Google

Newport Docks: The Great South Wales Coal and General Merchandise Port.

NEWPORT, Monmouthshire, has the two great advantages of being in close proximity to the South Wales Coalfield and also of being the nearest South Wales port to the Midlands. As a matter of fact, it is the nearest port to the steam coal collieries of South Wales.

Newport's history as a port goes back to early times, as there are very ancient records of trading on the River Usk, Roman vessels having sailed up the river to the ancient city of Caerleon, situate a few miles above Newport. Its modern history, however, may be said to coincide with the existence of its docks. The first dock (now known as the Town Dock) was opened in 1842, an extension in 1858 increasing the area of this dock to 11¼ acres.

In 1875 a great leap forward was made in the dock accommodation of the port. In that year the Alexandra Dock (now the Alexandra North Dock) was opened, 28¾ acres in extent, together with short railways connecting the docks with the adjoining main lines and with the railways serving the collieries. This very large increase in the dock water area naturally brought a big improvement in the trade of the port, and the improvement has steadily continued with the progressive policy of the dock proprietors, whose parliamentary title is now "The Alexandra (Newport and South Wales) Docks and Railway Company."

In 1894 the first portion of the Alexandra South Dock was opened, consisting of 20 acres in extension of the North Dock, with a new and larger lock entrance from the river, specially to serve the South Dock.

In 1907 the South Dock was further enlarged, and again in 1914, the two additions giving an extra water acreage of 75 acres. On July 14th of the latter year, also, was opened a new lock entrance, 1,000 ft. long by 100 ft. wide, the largest lock entrance in the world. The total water area of the Alexandra Docks is now about 125 acres, exclusive of the Town Dock.

The equipment of the docks in the shape of coal tipping appliances, and facilities for loading and discharging general cargoes, has kept pace with the extensions of the deep-water area.

As illustrating the growth of the port, it may be said that in 1875, when the first portion of the Alexandra Dock was opened, the coal shipments amounted to 394,000 tons, while the total imports and exports amounted to 565,000 tons.

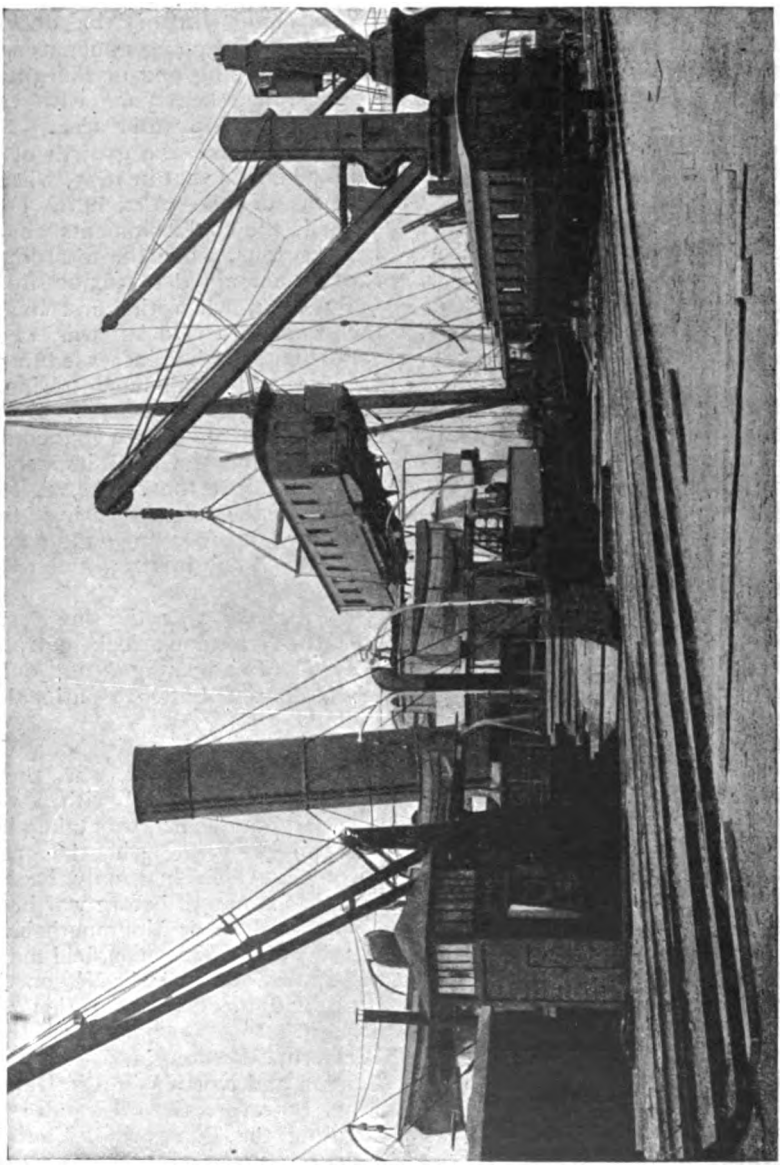
By 1894, when the first extension of the Alexandra Docks was opened, the coal shipments had increased to 3,620,000 tons annually, and the total imports and exports to 4,120,000 tons. By 1913, the coal shipments were 5,900,000 tons annually, and the total imports and exports 7,130,000 tons. The registered tonnage of the vessels using the docks amounted in 1913 to 3,130,000 tons, as against 296,927 in 1875, and 1,875,679 in 1894.

During the war the huge extensions and the enormous lock entrance have proved of advantage, not only to the whole district, but in a national sense as well.

As a matter of interest, one of the first prizes captured in the war, the German vessel s.s. "Belgia," with a very valuable cargo on board, was taken into Newport Docks through the new lock entrance, which had only been opened less than a month before war broke out.

The Eastern or Monmouthshire section of the South Wales coalfield may be said to be more particularly Newport's hinterland, and the coal from this district is brought to Newport by the Great Western, Brecon and Merthyr, and London and North Western Railways. In 1897, however, the Alexandra Company acquired the Pontypridd, Caerphilly and Newport Railway, extending from Newport to Pontypridd, and connecting the docks with the Glamorganshire or western portion of the coalfield. Newport has thus a direct service from all sections of the coalfield, which allows of the mixing of the different coals at Newport on shipment. The object of mixing is to com-

Digitized by Google

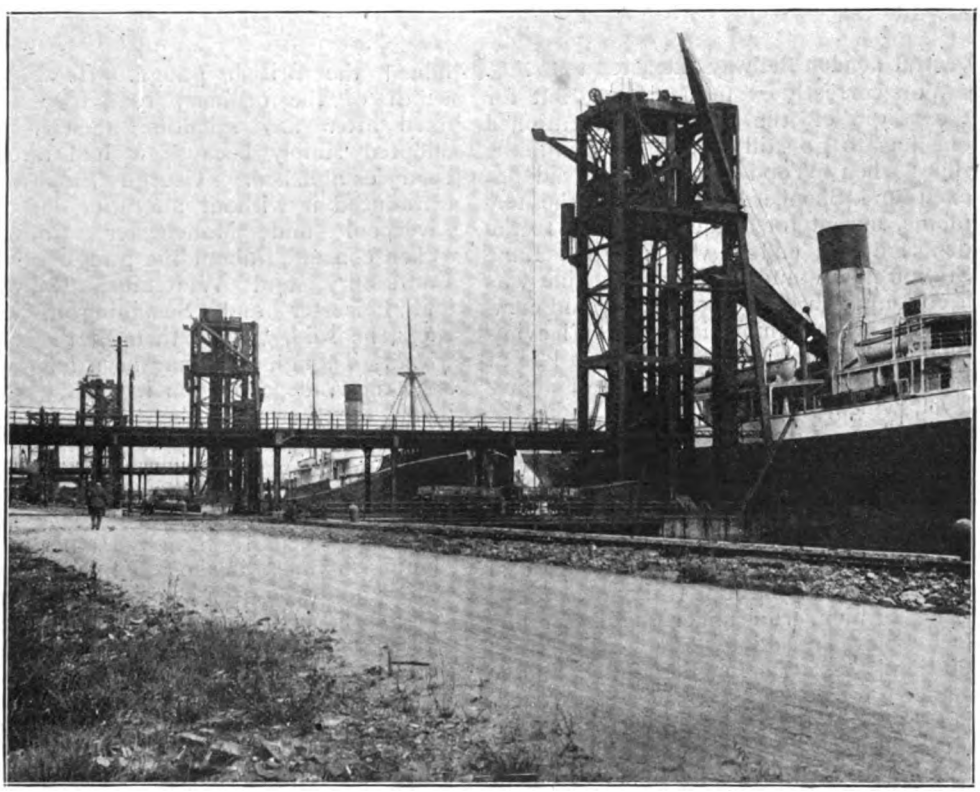


SHIPPING RAILWAY COACHES FOR EGYPTIAN STATE RAILWAYS AT NEWPORT DOCKS.

Digitized by Google

bine the qualities of the various kinds of coal so as to produce the highest efficiency.

The method of loading coal is by hoists, which lift the loaded wagons from ground level in order to tip the contents into the vessel, this being the usual practice in South Wales. The empty wagon, before it reaches the ground level, leaves the hoist by a high-level gantry, down which it runs by gravity to the collecting sidings for empty wagons. Newport has a reputation second to none for dispatch in loading coal.



COAL HOISTS (SHORE SIDE), NEWPORT DOCKS.

The general imports and exports are discharged and loaded by hydraulic cranes, of which there is a splendid range from 3 to 30 tons capacity. There are about 100 miles of railway sidings provided at the docks for storage of coal and other traffic awaiting shipment, and large shed accommodation for goods requiring such protection in transit.

Mr. J. H. Vickery, the general manager of the Alexandra (Newport and South Wales) Docks and Railway, was formerly assistant general manager of the London and South Western Railway. He entered the railway service under the latter company as a junior. He took up the general managership of the Alexandra Company early in 1913, and—displaying a clear vision and sound principles in finance and general development—has adopted a progressive policy that has placed and kept Newport Docks in the forefront of the great South Wales ports. Newport has honoured him by co-opting him as a Town Councillor, and also by electing him as President of the Chamber of Commerce. He is also a Justice of the Peace for the County Borough of Newport and Chairman of the Port Labour Committee.

Newport's magnificent dock accommodation, and the sound forward policy of the Alexandra Company, leave no room for doubt that the port has before it a future of progressive and immense development as one of the great national portals for the interchange of commerce.

Digitized by Google

The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Before asking for information concerning railway history and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," the twenty-first annual edition of which is on sale, price 5s. net, by post 5s. 6d. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

Central London Railway Extension to Ealing.

You correctly state the facts, but for the origin of the peculiarity mentioned one has to go still further back to the time when Wood Lane Station did not exist and Shepherd's Bush was the terminus, except for a line which ran to the depot, at the end of which Wood Lane Station now stands. This depot line was a continuation of the down line, and commences to rise immediately after leaving Shepherd's Bush Station. The up line at Shepherd's Bush terminated in a siding level, which, consequently, ran under the down line. Naturally, when the loop was made, the down line was continued round by Wood Lane Station, so as to join the up line at the end of the siding referred to. Consequently, down trains keep to the right, running round the loop, and when they become up trains at Wood Lane Station, run under the down line just before reaching Shepherd's Bush Station. As the junction for Ealing is made, for down trains just before reaching Wood Lane and for up trains just after passing Wood Lane, the right-hand running is continued until it is convenient to get normal running by another crossing just before the G.W.R. line is reached, where, of course, normal left-hand running is in force. Incidentally, this makes a flying junction at the junction with G.W.R., the trains to the City crossing under the G.W.R. line from Uxbridge Road, as well as the corresponding line from the C.L.R.

[Reply to RIFLEMAN L. C. NASH.]

Origin of the British Normal Gauge.

Smiles in his "Life of Stephenson" says:—"The original width of the coal train roads in the North virtually determined the British gauge. It was the width of the ordinary road track—not fixed after any scientific theory, but adopted simply because it had already been established. George Stephenson introduced it without alteration on the Liverpool and Manchester Railway. When consulted about the gauge of the Canterbury and Whitstable Railway, and Leicester and Swannington Railways, he said, 'Make them of the same width. Though they may be a long way apart now, depend upon it they will be joined together some day.'"

[Reply to J. CREAM.]

4-2-2 Locomotives.

Caledonian 4-2-2 engine, No. 123, derives her fame principally from the remarkable running she made in the race to Edinburgh of 1888, and also from being shown at the Edinburgh Exhibition in 1886, the year of her construction. She is now numbered, 1123. Referring to the answer given on p. 128 of the August issue, we are informed by Mr. L. B. Hewitt that the last G.W. Railway engine of this type was, he believes, scrapped several months ago. In the same answer we should have also included mention of the 4-2-2 engines of the Great Central Railway, several of which are still at work on the Cheshire Lines system.

[Further reply to T. HOLLOWAY.]

Midland and Great Northern Joint Railway Locomotives.

A number of the 4-4-0 engines in use on the above railway were built at Derby or by outside builders to the designs of Mr. S. W. Johnson, and conformed to the type then in use on the Midland Railway, but many of these have been

Digitized by Google

subsequently altered by Mr. W. Marriott, the present Engineer and Locomotive Superintendent of the M. and G.N.J.R., as, for example, in the provision of extended smokeboxes. Certain of them have been rebuilt entirely by Mr. Marriott, and now show material divergence from Midland practice.

[Reply to FRANK NORGATE.]

Some Permanent Way Queries.

Ballast is carried to such a depth in this country that weeds do not penetrate to any extent, especially where slag, granite, or cinders are used for ballasting purposes. Weeds give a little more trouble in gravel ballast, but are removed by the platelayers when they appear. Unused sleepers are usually covered with a layer of sand or earth in order to protect them, as far as possible, from the effects of weather, alternate wet and sunshine inducing harmful, results in the timber.

[Reply to W. S. UPTON.]

A Missing Month.

For the information of readers who, like yourself, did not place an order with a bookseller or newsagent before the publication of the July RAILWAY MAGAZINE, we have to say that this issue is still in stock, and can be supplied direct from the publishing offices, 30, Fetter Lane, E.C.4, on receipt of 1s. 2d. Many readers have complained that their newsagents have stated that the part is "out of print." This is incorrect; it is still on sale.

[Reply to CORPORAL A. FOX.]

Locomotive Fuel Consumption.

For rough calculations, the *Locomotive Engineer's Pocket Book and Diary*, published at 3, Amen Corner, London, E.C., provides the following data, for the estimation of the fuel consumption of locomotives :—

(Engines of modern build, coal of average quality).
Main line express and passenger—40 lbs. per mile, or .13 lb. per ton mile.
Main line goods and minerals—60 lbs per mile, or .1 lb. per ton mile.
Suburban tank locomotives—50 lbs. per mile, or .2 lb. per ton mile.

[Reply to "TELEPHONE CALL."]

Double Deck Railway Bridge.

We presume you refer to the railway bridge over the Kansas River, U.S.A. As traffic had to be maintained without interruption during erection, it was necessary to erect the new structure around the old one. The new bridge has two railway tracks on each deck, the span being 300 ft., and the depth between the centres of chords being 65 ft., which is considerably in excess of usual proportions.

[Reply to J. THOROGOOD.]

The Weir Feed-Water Heater on the Great Eastern Railway.

Engine No. 1240—0-6-0 superheater goods locomotive—and also No. 1791, of the 4-4-0 express "Claud Hamilton" class, were equipped with this heater and the Weir feed-pump in 1915. In the former case the heater is carried on the top of the boiler, between the chimney and the dome, as you state, and in the latter above the footplating at the left-hand leading end of the engine.

[Reply to J. B. L. C. PRIDEAUX.]

Coupling Chains.

Coupling chains were for many years employed on passenger vehicles in this country, in addition to the screw coupling, as a safeguard in case of the breakage of the latter, but the use of continuous brakes, which effect an immediate stoppage of both halves of a train in an eventuality of this character, renders the retention of side couplings unnecessary.

[Reply to "SO'WESTERN."]

Some Metropolitan Railway Queries.

The only direct route from Westbourne Park to the Metropolitan line (Inner Circle, eastbound) is *via* Bishop's Road Station, and this consists of two roads, up and down, only. There are also only two roads from Baker Street to King's Cross, Metropolitan, and your friend is in error in referring to non-stop trains, none of which are, or have been, run on the northern portion of the "Circle."

[Reply to A. R. COWLISHAW.]

Railway Bridge Over Victoria Falls.

This famous cantilever bridge crosses the Zambesi for a distance of 650 ft. at a height from low-water levels to the rails of about 420 ft., or about 380 ft. from high water. The contractors were the Cleveland Bridge Company of Darlington, and the work was completed April 1st, 1905.

[Reply to J. B. JENKINS.]

Digitized by Google

Flangeless Driving Wheels.

It is often the practice in the case of coupled engines with long fixed wheelbases for one of the central pairs of coupled wheels to be arranged without flanges, *i.e.*, without the downward projection of the tyres which enable the wheels to keep the road. This omission enables such engines the more readily to traverse sharp curves.

[Reply to T. HOLLOWAY.]

Underground Permanent Way.

There is a scaling on the current rails which is ordinary rusting. There is also in many places a fine deposit on the permanent way near to the running rails, which is, generally speaking, break block dust which has rusted. We do not know of any deposit which could in any way be looked upon as due to, or influenced by, the presence of current rails.

[Reply to "DAN."]

Colour of Great Northern Locomotives.

Grey with white lettering has been the standard colour of Great Northern main line goods locomotives, and of passenger and goods tank engines, since the early stages of the war, being adopted as a measure of war-time economy. The new 2-8-0, No. 461, is painted grey.

[Reply to C. W. RUTTER.]

2-6-2 Locomotives.

We are afraid you must refer to the Locomotive Superintendents concerned as to why this type of express engine has never found acceptance in this country. We cannot give you any reason other than that existing types fulfil all the duties required of them satisfactorily.

[Reply to R. W. RAVENHILL.]

4-4-2 Tank and 4-2-2 Express Engines, Great Northern Railway.

The 4-4-2 tank engines of this company numbered 1009-1018 inclusive work mainly in the neighbourhood of Leeds and Bradford, and such of the 4-2-2 engines of Ivatt's design as remain at work at present are, we believe, to be found principally on the Lincolnshire lines.

[Reply to F. A. BROWN.]

Continental Railway Practice.

As it is doubtless French railway working in which you are the most interested, we cannot think of a better book for your purpose than Lord Monkswell's excellent little treatise on "French Railways," published by Messrs. Smith, Elder and Co., at 3s. net.

[Reply to R. F. DRAKE.]

Severn Tunnel.

Gradient profile of the Severn Tunnel appeared in the RAILWAY MAGAZINE, February, 1906, as an illustration to an article giving the history of the enterprise. The part is out of print, but you might obtain a copy through a second-hand bookseller.

[Reply to GEO. FEARNE.]

Central Wales Railway.

Formal opening of the Central Wales Railway from Knighton to Llandrindod took place on October 10th, 1863, and that of the Central Wales Extension Railway from Llandrindod to Llandovery on October 8th, 1868.

[Reply to OWEN JONES.]

Largest Railway Crossing.

Newcastle-on-Tyne, North Eastern Railway, not only boasts the largest railway crossing in England, but one that is likewise the largest in the world. It was illustrated in the RAILWAY MAGAZINE, March, 1917.

[Reply to GUNNER J. WINSHIP.]

The "Most Powerful Engine."

Of the three types you name, the L. and N.W.R. "Claughtons" are decidedly the most powerful, as judged on the basis of nominal tractive effort, length and weight.

[Reply to FRANK NORGATE.]

Campbeltown and Machrihanish Light Railway.

This line was incorporated under the Light Railways Act, May 8th, 1905. It was opened for passenger traffic, August 16th, 1906.

[Reply to ALEC SCOTT.]

0-8-4 Type Tank Engines, Great Central Railway.

These locomotives were built in order to bank goods trains up the inclines at the Wath gravity concentration sidings, near Barnsley, Yorks.

[Reply to G. H. W.]

Great Central Railway New 2-8-0 Engines.

Boilers are designed for 200 lb. pressure, and that figure has been used in certain calculations.

[Reply to "CONSOLIDATION."]

Digitized by Google

The Owners' Risk Note.

By CHARLES DIX.

ONE of the most important factors in the development of British industry by our railways is the Owners' Risk Note, or, rather, the reduced charge for carriage of goods conveyed at the owners' risk rates.

For example, the conveyance of milk by passenger train! A churn of milk containing 17 imperial gallons weighs something like 2 cwt., and if conveyed at the ordinary parcel scale would entail an average charge of about 1d. per lb.—say, 19s.; and as the value of the milk itself would only amount to 30s.-34s., traffic could only be conveyed at a loss to the trader. But under the Owners' Risk Note the railways contract to base the charge for carriage on the milk only, the churns being conveyed without payment, and the charge for carriage actually including the return of the empty churns. An outside average charge for conveyance of a churn containing 17 imperial gallons of milk may be taken as 1s. 8d., and the advantage thus conferred upon the trader needs no further demonstration.

Naturally, the railways demand some consideration in return for these concessions, and the Owners' Risk Note provides for the limitation of their liability as carriers and lays down conditions of transit; but these are not unreasonable, and that the trader derives a valuable benefit is proved by the prevailing prosperous position of the milk trade.

Perhaps no question has caused more discussion and excited more feeling amongst the trading community in relation to the transit of goods by rail than the operation of the Owners' Risk Note; and there is much misconception as to its actual conditions and application.

Broadly, the Owners' Risk Note is an agreement between the railway and the trader, under which the latter derives the benefit of having specified classes of goods conveyed at a considerably reduced rate, and he in return relieves the railway to some extent from liability in connection with the ordinary risks of rail transit. When loss, damage or delay has occurred as the result of wilful misconduct on the part of the railway or its servants, the Owners' Risk Note provides that there shall be no exemption from liability, which thereupon becomes that of a common carrier.

As common carriers, railways are the insurers of goods entrusted to them for conveyance, but this is a generality which requires some qualification, inasmuch as there are two rail services—viz., passenger and goods—and whereas the railways are bound to convey traffic tendered to them for conveyance by goods train, they are only compelled by law to convey certain classes of perishable goods by passenger train, as laid down in the Rates and Charges Orders Confirmation Act of 1891-2:—Milk, butter, cream, cheese (soft), eggs, fish, fruit, game, meat, poultry, rabbits, vegetables, and ice.

Railways are not bound to accept and are not common carriers of general merchandise by passenger train, but voluntarily concede to the public the benefit of improved transit of goods by passenger train, and as voluntarily assume the liability of common carriers in respect of such goods.

A point frequently overlooked is that railways refuse to convey by passenger train traffic other than those perishable goods referred to in the Rates and Charges Orders Confirmation Act, and that in connection with all other goods they may convey by the superior service they are entitled to impose their own conditions.

The general conditions of passenger train transit (which are on view at all railway stations) are, however, identical with those applied to traffic by goods train; whilst the passenger train charges are based on a scale the moderation of which is proved by the enormous parcel traffic by passenger train throughout the United Kingdom, the more rapid transit

Digitized by Google

being a more than adequate equivalent for the difference between the goods and passenger train rates.

One of the first principles on which railway rates were based was a proper consideration of the question as to what charge the traffic could bear, and the owners' risk rates represent an elaboration of this principle on wide and generous lines, which, although dictated to some extent by the policy of competition, has yielded immense advantages to the trading community, and, on the other hand, has involved some considerable sacrifice on the part of the railways.

It cannot be too strongly emphasised that *the owners' risk rates*, both in the goods and passenger departments, *are not the normal rates* of carriage as seems to be usually understood, but are specially reduced rates which have been put into operation to assist trade, encourage industry, and build up traffics which otherwise would not represent a working proposition from the trader's point of view; and it should be remembered that these reduced rates have entailed a heavy strain on the railways, increased working expenditure for a minimum remuneration and in some instances, as in the case of milk, for a remuneration which can only be regarded as producing an exceedingly problematical margin of profit.

The benefits conferred on the trader by the Owners' Risk Note are thus reduced rates (roughly speaking, they are about half the ordinary rates) and the opportunity of securing passenger train transit, with its more frequent and rapid service, for commodities which, from a commercial point of view, would not easily bear the burden of ordinary rates, or, in the case of goods requiring rapid transit, the ordinary passenger train charges.

Against these benefits the trader is required to modify his position in regard to the liability of the railway as common carriers of goods so conveyed—hence the conditions of the Owners' Risk Note which the trader is called upon to sign before his goods are accepted at the lower rate, such signature to a written contract being necessary under the Railway and Canal Traffic Act of 1854.

Although the goods and passenger services each has its own form of Owners' Risk Note, the general conditions are identical, and apply equally to owners' and company's risk traffic. Similarly, the main general term of both goods and passenger train contracts is that the railway shall be exempted from all liability for loss, damage, misconveyance, misdelivery, delay or detention, except upon proof that loss from any of these causes has arisen from the wilful misconduct of the company or its servants. Provision is made for exceptional cases, representing far-reaching modifications of this general term, and it is in regard to these exceptions that a proper understanding of the respective legal positions of the two services with respect to the acceptance of goods and merchandise for conveyance is necessary in order to appreciate what appears to be an arbitrary differentiation.

Thus, the goods department accepts liability for all classes of owners' risk traffic in the event of:—

(1) Non-delivery of goods fully and properly addressed—unless due to accidents to trains or vessels, or to fire.

(2) Pilferage of goods adequately packed—when pointed out to a servant of the company on or before delivery.

(3) Misdelivery of goods properly addressed—where goods are not tendered to the correct consignee within 28 days after dispatch.

Whereas in the case of passenger train traffic the exceptions to the main term of the contract apply only to the particular classes of perishable traffic which the railways are, by law, bound to accept per passenger train.

Moreover, whilst exceptions (1) and (2) as applied to this specified perishable traffic are identical with those in the goods train contract, exception (3) applies only to cases where perishable goods, as the result of delay exceeding 48 hours, have deteriorated to the extent of three-fourths of their value, the limitation of the railway's liability to half such diminution in value being consistent with the highly perishable nature of the traffic and the consequent risk of losses which are out of all proportion to the rate of carriage charged.

In actual practice the railways apply these exceptions to all perishable traffic by passenger trains, and do not exercise the legal right to limit their application to the specific commodities mentioned in

Digitized by Google

the Rates and Charges Orders Confirmation Act—and, in fact, do not exclude non-perishable goods, although they are under no legal obligation to carry such goods, and have every justification for taking advantage of the protection afforded by the Owners' Risk Note.

For many years the railways, obsessed by the policy of competition, attached little importance to the protective qualities of the Owners' Risk Note, and claims on traffic conveyed at the reduced rates were dealt with in the same way as claims on traffic conveyed at company's risk rates. But with the elimination of competition and the tendency towards working agreements and amalgamations, the significance of the Owners' Risk Note came to be realised, and in 1900 the Scottish railways issued a public notice that claims on owners' risk traffic conveyed between Scottish stations and stations in England and Wales, by both passenger and goods trains, would be dealt with on their legal merits.

Then several of the larger English railways issued a similar notice as regards traffic from Scotland, for the reason that claims on traffic from Scotland hitherto made on Scottish railways were now made on English railways, and uniformity of practice became necessary.

Following this arrangement in regard to traffic between England and Scotland, the railways began to review their position as to all traffic at the owner's risk, with the result that claims were found to represent a disbursement which could not be justified by the value of the traffic from the point of view of carriage charges, and, moreover, that not only were such claims numerous, but they were continually increasing, and it was decided in 1902 that all claims made on traffic conveyed at the owner's risk should be submitted to a Joint Conference of Railway Companies' representatives, who should adjudicate upon the merits of each claim.

In view of the legal position of the railways, the formation of this Conference was undoubtedly a concession to the trading community; and it was so intended, as, recognising that the payment of claims on owners' risk traffic had become the common practice, the railways were desirous that the terms of the owners' risk contract should be as broadly interpreted and applied as they consistently could, so as to cause the least disturbance to the trader, whilst at the same time securing to themselves the principles of protection contained in the contract. Consequently, the trading community, notwithstanding their manifold objections to the owners' risk conditions, are actually receiving a consideration from the railways, especially so far as passenger train traffic is concerned (and it is in connection with passenger train traffic that these objections have chiefly arisen), far beyond the terms contracted for; and, despite the protection afforded to the railways by the Owners' Risk Note, are in a large proportion of cases very much in the same position as though their goods were conveyed at the company's risk rates. To further demonstrate this attitude of the railways it may be mentioned that prior to 1910 the Owners' Risk Note protected the railways *entirely*, except upon proof of wilful misconduct on the part of the company or its servants; but in view of the lack of knowledge and appreciation of the generous treatment conceded to traders by the railways in dealing with owners' risk claims, a draft of the minimum concessions allowed in practice was prepared under the heads:—non-delivery, pilferage, and delay, and these are embodied in the owners' risk contract as it exists to-day, in the shape of the "exceptions" referred to earlier.

The validity of the Owners' Risk Note has been tested more than once, both from the point of view that it is not in the public interest that railway companies should be in a position to put undue pressure on traders to accept liability for loss or damage, and on the ground that the Railway and Canal Traffic Act of 1854 provides that any contract thus relieving the railways from liability must be just and reasonable; but the Courts have always held that the Owners' Risk Note is perfectly valid, being just and reasonable in law, and that the company's risk rates provide a reasonable alternative.

Quoting Mr. Edwin A. Pratt, the author of "Railways and their Rates," the following statement indicates the generous treatment meted out to the traders by the railways in connection with

Digitized by Google

claims on traffic conveyed at the owner's risk, the three cases mentioned being specific instances in regard to firms which are here shown as A, B, and C. :—

	A.	B.	C.
Saving effected by firm during a stated period by consigning at O.R. instead of C.R.	£6,000	£1,572	£360
O.R. claims made by firm which have been disallowed during the same period...	4	60	14

Confirmation of this generous attitude of the railways with respect to the interpretation of the owners' risk contract is contained in the further statement that out of 294 claims made against one English railway company in a given period, on traffic conveyed under the O.R. note no fewer than 112 were paid; whilst out of a total of 2,003 claims arising during a period of three months, 717 (or 35 per cent.) have been met; and of £2,402 claimed, £772 (or 32 per cent.) was paid.

Apart from the general Owners' Risk Note, it might be well to mention there are other forms of Owners' Risk Notes; but these have not the same universal significance to the trading community, and partake of the nature of special contracts governing exceptional traffics under exceptional circumstances. One of these, relating to the conveyance of milk, has already been mentioned. Special conditions also exist with respect to the conveyance of explosives, inflammable goods, wild animals, etc.; but the ordinary Owners' Risk Note is sometimes confused with the special contract covering the conveyance of "damageable goods not properly protected by packing," in connection with which traders are not prepared to incur the expense of adequate packing, and which, therefore, considering the innate infirmity of the goods, the railways will only accept at the risk of the owner, disclaiming all liability except upon proof of wilful misconduct on the part of the company.

It should be understood that the term "owners' risk," as usually applied, refers to the voluntary contract under which the trader has the option of forwarding his goods at a greatly reduced rate, a reduction in many cases of 30, 40 and even 50 per cent. of the ordinary rates of carriage, and in return agrees to relieve the railway of some portion of its liability as a carrier. The trader gets the better of the bargain, as, notwithstanding that the conditions of the Owners' Risk Note are more stringently applied than formerly, the railways still adhere to their original policy of encouraging traffics, and continue to pay a high percentage of owners' risk claims, which technically might be disallowed under the owners' risk contract; and, taking the percentage of the reduction in charges in conjunction with the percentage of claims paid, and comparing the value of these concessions with such reduction of the ordinary rates of carriage as would represent an adequate insurance against the risks of rail transit (generally estimated at 5 per cent.), it cannot be denied that the Owners' Risk Note in actual practice more than fulfils the legal requirement that its terms shall shall be just and reasonable.

Digitized by Google

*Revised Engine Head Signals.

THE introduction of a new series of Engine Head Signals has extensively revised a code with which railwaymen had, by years of association, become familiar. Five out of the ten former signals have not been abolished, but the other five have been changed. Previously there were four that were indicated by different positions of *three* lamps. All these have gone, and in place of them we have two signals with *two* lamps, and two with *one* lamp. In another case, namely, "G," the position of the single lamp has been altered.

It is necessary for nearly every man engaged in connection with traffic working to know the engine head-marks and the descriptions of trains they respectively denote. We have therefore devised a method by which they can be memorised in a few minutes. Indeed, the reader will find that if he goes carefully through this article, glancing at the illustrations as they are mentioned, he will already have mastered the whole subject.

In Fig. 1 is given the complete codes. At first sight it appears a formidable task to learn the positions of the lamps corresponding to the several letters of the alphabet. By the employment of some simple "aids to memory," however, the process becomes as easy as the result is striking.

It will be seen that only one lamp is used for four different codes, namely, "B," "G," "J," and "K." Let us memorise these first. Notice the picture given in Fig. 2. Its very novelty will fix it in your mind. The chief feature in instantaneous memorising is the provision of an "aid" that strikes one as novel. The picture consists of a JUG and a BIG BOOK. Now, observe the way in which we set out the names of these articles, namely—

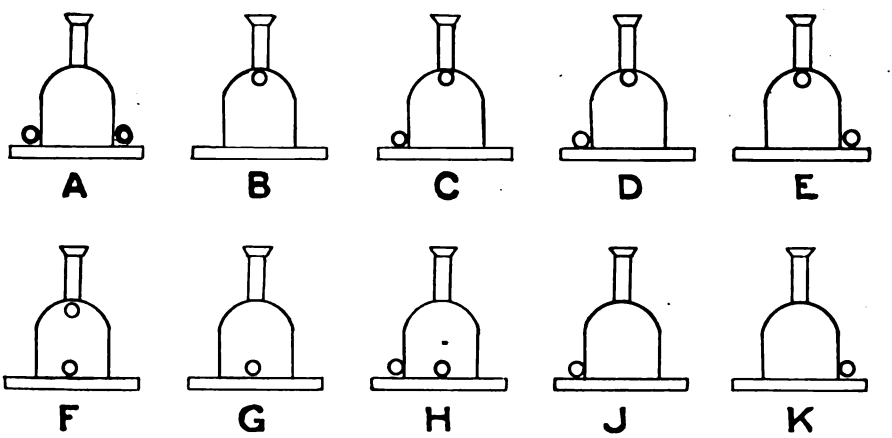


FIG. 1.—THE COMPLETE SET OF ENGINE HEAD SIGNALS.

B
I O
O
J U G K

And if we take away all the letters except the *first* and *last* in each word, we have this :—

B
* *
*
J * G K

Compare these letters with the head marks corresponding to them in Fig. 1,

* By Edward S. Hadley in the *Great Western Railway Magazine.*

Digitized by Google

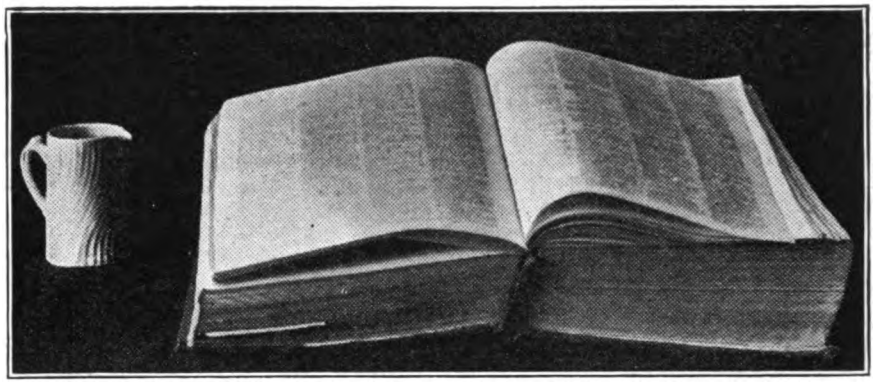


FIG. 2.—AID TO MEMORY FOR ONE-LAMP ENGINE HEAD SIGNALS: JUG AND BIG BOOK.

and you will find that their positions agree with the four single-lamp signals.

There remain six other signals. Each of these consists of *two* lamps. It will be noticed that "C" and "D" are alike. tion of these will impress them upon your memory.

To avoid the possibility of confusing "C" or "D" with "E," glance at Fig. 4. The letters "C" and "D"

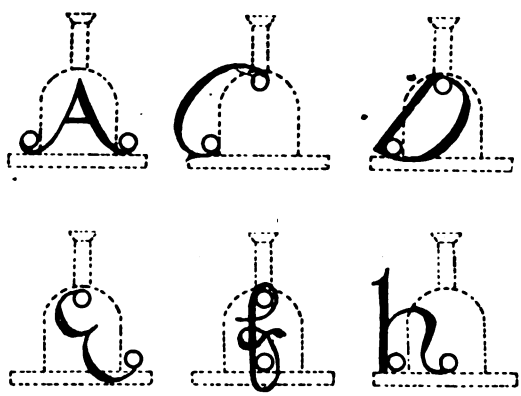


FIG. 3.

AIDS TO MEMORY FOR TWO-LAMP ENGINE HEAD SIGNALS.

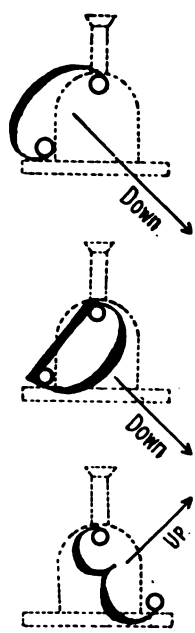


FIG. 4.

Now examine Fig. 3, and compare each signal with the same one in Fig. 1. Notice how the letters of the alphabet are built upon the lamps they correspond to. A few moments' observa- slant downward, and "E" slants upward. To remember this, think of "C" for *Condescend* (suggesting *Down*), "D" for *Down*, and "E" for *Elevate* (suggesting *Up*).

Digitized by Google

DESCRIPTIONS OF TRAINS.—For remembering what description of train is denoted by each letter, the following "aids to memory" are given:—

AIDS TO MEMORY FOR "DESCRIPTIONS" OF TRAINS.

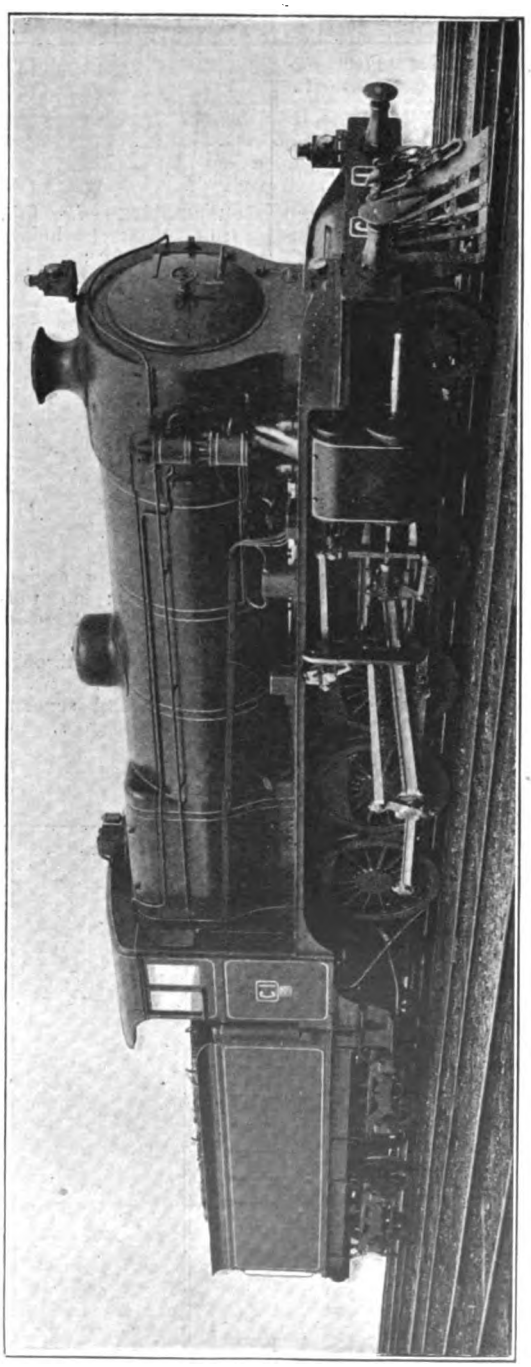
Letter.	Description of Train.	Aid to Memory.	Explanation.
A	Express Passenger train, Breakdown Van train going to clear the line, or Light Engine going to assist disabled train.	A for **Accelerate** (suggesting express), also for **Accident.**	
B	Ordinary Passenger train, or Breakdown Van train not going to clear the line.	B for **Booked everywhere** (ordinary train), also for **Breakdown.**	
C	Fish, Meat, Fruit, Horse, Cattle, or Perishable train composed of Coaching Stock. Also Goods, Mineral and Ballast trains composed entirely of Vacuum Stock.	C for **Consumables** and **Coaches**, also for **Cylinder** or **Connecting pipes** (suggesting vacuum apparatus).	**Consumables** — *i.e.*, fish, fruit, meat (including horseflesh), &c.; **Coaches** — *i.e.*, coaching stock.
D	Empty Coaching Stock train.	D for **Deserted** or **Depopulated.**	
E	Fish, Meat, or Fruit train composed of Goods Stock, Express Cattle, or Express Goods train, Class A.	E for **Eatables**, also for **Express.** E is a vowel, so is A (Class A).	
F	Express Cattle or Express Goods train, Class B. *These Head Lights may also be carried by full Train loads of Ballast or other Materials for Engineering purposes if running intact long distances.*	F for **Fast-freight**, and for **Fodder** (suggesting Cattle. F is a consonant, so is B (Class B). Also F for **Full loads of filling far-going.**	
G	Light Engine or Light Engines coupled together, or Engine and brake.	G for **Gainless.**	Only engines, or engines and brakes; no toll-paying traffic, therefore **gainless.**
H	Goods, Mineral, or Ballast train carrying through load to destination.	H for **Homeward.**	**Homeward**—*i.e.*, through to destination.
J	Through Goods, Mineral, or Ballast train stopping at intermediate stations.	J for **Journeying through** and **Jogging along.**	**Jogging along** suggests intermediate stops.
K	Ordinary Goods or Mineral train stopping at intermediate stations.	K for **Keeps stopping.**	

RAILWAY YEAR BOOK.

The Railway Year Book, 1918 (published by the "Railway Magazine"; 5s. net), has reached its twenty-first year. In addition to the usual information in regard to capital, rolling stock and other railway matters, a "railway miscellany" has been introduced into the new edition providing a number of interesting facts, and much useful information, and a number of new biographies have been added to the "Who's Who." In every way the volume fully maintains its position as a standard reference work.—*Financial News.*

Digitized by Google

Australian New 2-8-0 Type Locomotive.



A NEW 2-8-0 type locomotive for the Victorian Railways was recently completed at the Government railway workshops at Newport.

When the standard designs of locomotives for the Victorian Railways were adopted it was decided to include among them the 2-8-0 type, but it was found some of the bridges and structures on the main line concerned would require to be strengthened before these locomotives could be introduced. The necessary work has since been done, and in 1915 authority was given Mr. W. M. Shannon, the Chief Mechanical Engineer, for the preparation of designs for a goods locomotive of the type referred to, with axle loads not exceeding 18 tons.

The following are some of the leading particulars:

Dia. of driving wheels ...	5 ft.
Cylinders...	22 in. dia. by 28 in. stroke
Tractive power	36,138 lb.
Boiler pressure	200 lb. per sq. in.
Heating surface—	
Firebox	173 sq. ft.
Tubes	1,879 „
Superheater...	369 „
Total	2,421 sq. ft.
Grate area	32
Tender capacity—	
Water	4,600 galls.
Fuel	6½ tons
Total length over all, engine and tender ...	64 ft. 4½ in.
Total weight—	
Empty...	91 tons
Roadworthy	127 „

Modern practice in locomotive design has been followed, with the necessary modifications to meet local conditions of working. The boiler has been made of large proportions, particularly as regards firebox and grate, to suit the class of coal used on the Victorian Railways. The superheater is of the "Robinson" type.

Digitized by Google

Victorian Railways: New Cars for Special and Excursion Traffic.

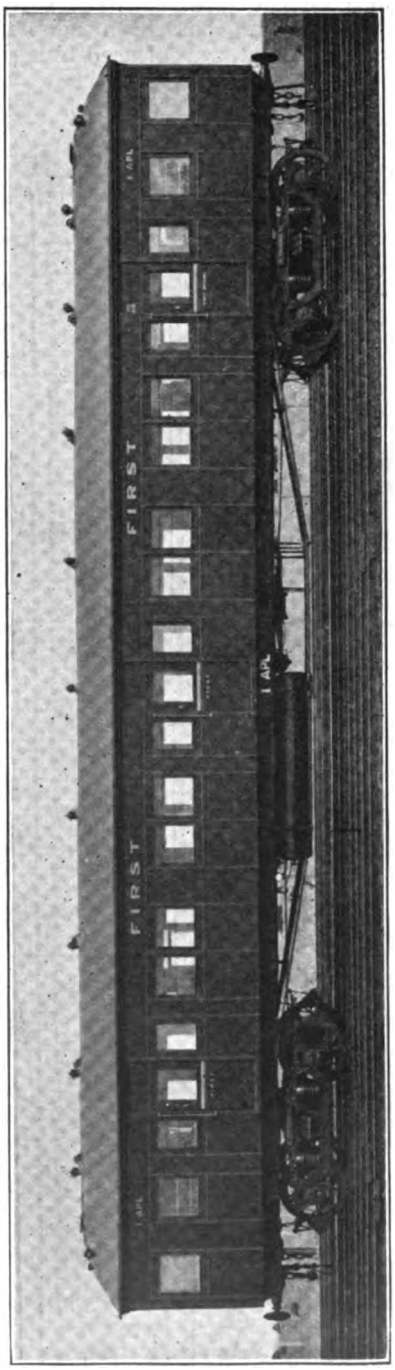
WHEN the electrification of the Melbourne-Suburban lines is in full operation, it will not be practicable, owing to the electrical equipment and the change in the method of lighting, to continue to utilise the suburban cars for country special and excursion traffic.

The Commissioners have, therefore, arranged, when funds permit, for the construction of cars of a suitable type to accommodate this class of traffic, and a new car, as here illustrated, has been recently completed at the Government Railway workshops at Newport to designs prepared under the supervision of the Chief Mechanical Engineer, Mr. W. M. Shannon.

Under the electrification scheme a number of the existing swing door bogie cars will be used as motor coaches, new underframes and bogies of similar design to those built for the new sliding door cars being provided for them; and the underframes and bogies thus released are being utilised for the excursion cars. By the provision of the new bodies an excellent type of car for this service is being obtained for an expenditure of about £1,000, as compared with about £1,800 for a new car, and very profitable use is made of the old underframes.

In general appearance the new car somewhat resembles the Victorian Railways standard sliding door suburban cars, the sliding doors, steel panels, passage ways and partitions being similar, but, to suit the longer journeys, the number of doors has been reduced to one-third, viz., one on each side of each of the three main saloons. One of the saloon compartments is reserved for smokers, and a small compartment is set apart for ladies at the other end of the car. Lavatory and sanitary conveniences on the same principle, but of improved design to those fitted in Victorian Railways country cars, and made at the workshops, have been placed in the car. Pintsch gas lighting is also used.

The arrangement of the first and second class excursion cars will be the same, but the seats of the first-class cars will be trimmed with blue chrome tanned leather of local manufacture.



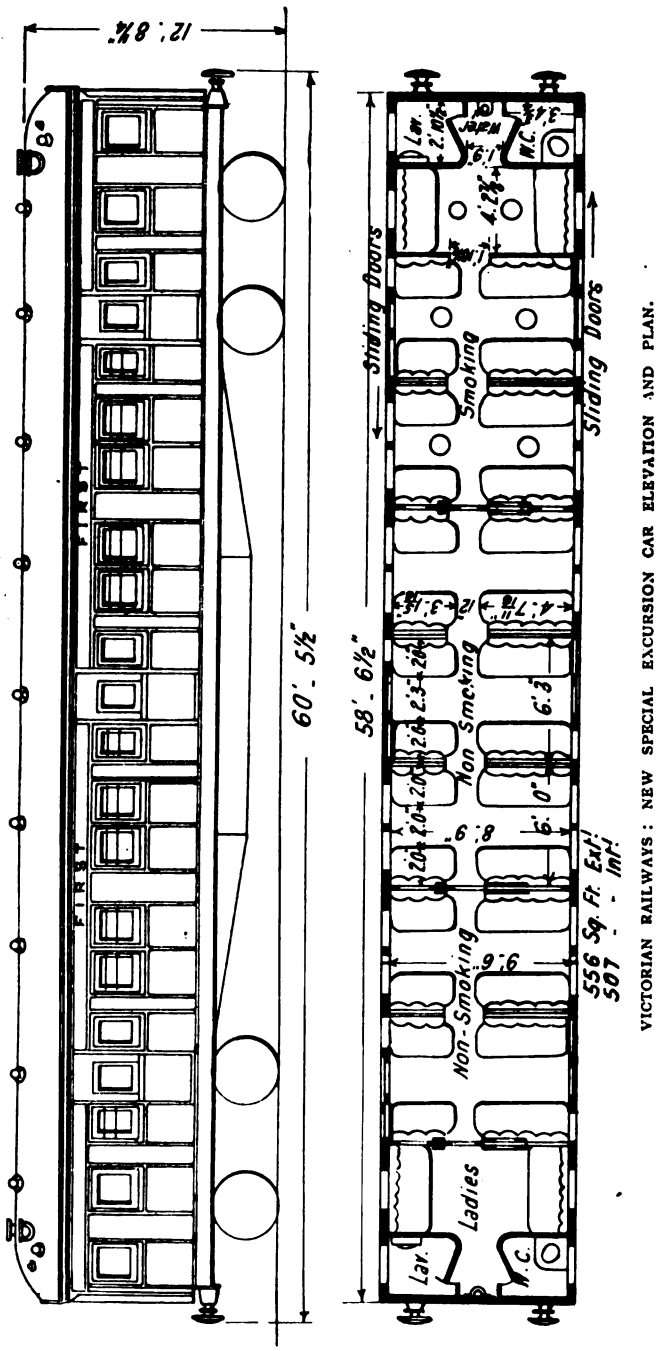
VICTORIAN RAILWAYS. NEW SPECIAL EXCURSION CAR.

Digitized by Google

The seats have been made as high as comfort will allow to enable dress baskets, portmanteaux and other luggage to be stowed underneath.

The elliptical type of roof, with torpedo ventilators, has been adopted in lieu of the clerestory roof used hitherto on the Victorian Railways in order to secure simplicity and lightness of construction, and permitting of an airy, well lighted car being built and one that is economical to clean and maintain in repair.

Complete, the new car weighs 26 tons, and can comfortably seat 82 passengers.



VICTORIAN RAILWAYS: NEW SPECIAL EXCURSION CAR ELEVATION AND PLAN.

Digitized by Google

Railway Literature.

MODERN LOCOMOTIVE VALVES AND VALVE GEARS. By Chas. L. McShane. *Illustrated.* [1918. Griffin and Winters, New York Life Building, Chicago, Ill., U.S.A. Cloth, 340 pages. Price $2.50.] Numerous books have been produced in the past regarding the subject of valves and valve gears, but Mr. McShane's work is an attempt to treat the modern types from a strictly practical standpoint. He assumes no knowledge on the part of the reader regarding the subject, and as a result, has devoted much space to elementary or fundamental principles, so as to enable the apprentice or student to travel the road from early to modern practice with ease.

Mr. McShane has tried to confine his discussion to the valve and valve gear used on the locomotive, as distinguished from the stationary engine, and in order to make things as plain as the technical character of the subject will permit, he has first of all devoted several pages to explaining the meaning of the terms and expressions most commonly used in discussing the valve and the valve gear, and then later on he gives the reason for their application. Everything that can possibly be illustrated is so treated, and the following is a brief synopsis of the contents of the book:—

Slide Valves.—Illustrated historical review; advantages and disadvantages; necessary functions, methods of construction and operation of parts, with descriptions of the new types.

Balanced Valves.—Advantages and disadvantages. Comparison with piston and plain slide valves. Historical summary. Methods of balancing. Allen-Richardson, American, Gould, Mewes, Miller, Miller double ported, Richardson, Walsh and Wilson types.

Piston Valves.—History. Advantages and disadvantages. Comparison with balanced valves. Construction and operation. Cylinders, etc. Allfree, American semi-plug, built-up, solid and Young types. Straightway piston valve arrangement. New method of applying piston valves to side vale cylinders, and Sheedy's method of converting old inside steam pipe cylinders into outside steam pipe cylinders for piston valves.

Valve Gears.—Historical analysis from gab-hooks to modern forms. Construction and operation of the Walschaert, Baker, Southern and Young types.

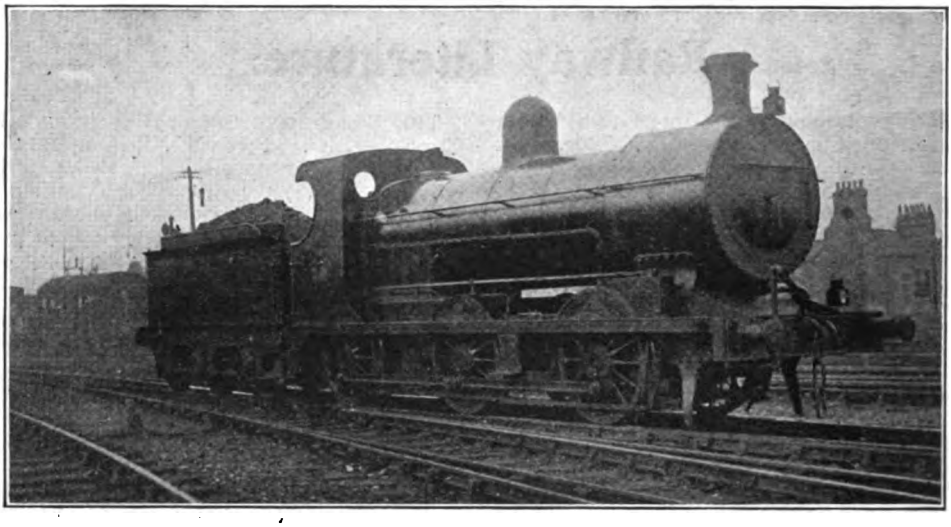
Valve Setting.—Explains exactly how to adjust or set valves, and shows how the work should be done.

Accidents or Breakdowns.—Tells how and shows what to do in case of accident or breakdown on the road.

THE LOCOMOTIVE SIMPLY EXPLAINED. By Chas. S. Lake. [Percival Marshall and Co., 66, Farringdon Street, London, E.C.4. Price 6d. By post, 7½d.] A seventh edition of this excellent first introduction to the study of the locomotive engine has just been published. In preparing the book for the press, Mr. Lake has kept in view the necessity for clearing away the difficulties which beset the path of the seeker after information concerning locomotive engines and their work. His explanations are brief, but always clear, and, as a result, the student's path is rendered easier. We strongly recommend the book to all who have no knowledge of locomotive matters, but desire to possess it, while those who have a little knowledge will find within its pages a store of valuable facts with which they were previously unacquainted. Beginning with the boiler, Mr. Lake passes on to the engine, and then deals with locomotive types. The treatise includes a locomotive catechism in brief. In paper covers, and consisting of nearly 60 well-illustrated pages, the book is certainly worth more than the modest sum charged for it.

SUPPLEMENTARY LIST OF L. AND N.W. LOCOMOTIVES. [Compiled and published by C. Williams, 73, Chetwode Street, Crewe. Paper covers, 1s. 6d. net; 1s. 6½d. post free.] This list is supplementary to the original list of 1912, and contains all the information embodied in the 1913 supplement, so that the complication of referring to two supplements is thereby avoided. The new pamphlet appears to have been compiled with all the care of its predecessors both as regards numbers, names, and types, and is an indispensable handbook to those who are interested in the extensive locomotive stock of this popular railway. We notice that in the original volume the first nine engines of the "George the Fifth" class, including No. 2663, were shown as having 20 in. cylinders only, but mention is omitted of this in the supplement, whereas the ten "Queen Mary" class engines of the 1912 volume are now shown in the supplement as being fitted with 20 in. cylinders in place of their previous 19 in. cylinders. Further, the remark is made in reference to the "Precursor" class engines most recently superheated that Nos. 302, 323, and 1309 have *not* 20½ in. cylinders, without giving details as to what is their present cylinder diameter. It would be interesting to have these points definitely cleared up—*i.e.*, as to whether the original "George the Fifth" and "Queen Mary" class engines have had their cylinders bored out to 20½ and 20 in. respectively, and

Digitized by Google



Photo] [*J. Macartney Robbins.*

GREAT NORTHERN RAILWAY (IRELAND).

0-6-0 engine; No. 39 (*formerly Beragh*), at Dublin.

This locomotive has been partly rebuilt. The Phœnix superheater has been removed, a new cast iron chimney fitted, and a Detroit sight feet lubricator furnished.

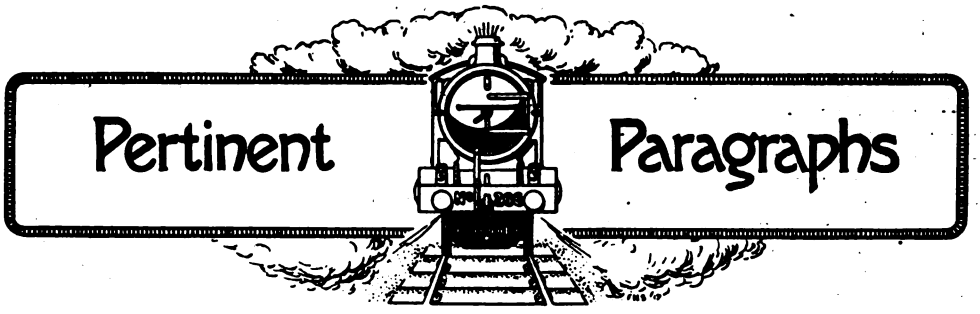
whether the " Precursors " last named retain their original 19 in. cylinders. We might suggest that in any future edition fuller dimensions are given in relation to each class, perhaps in tabular form, as the value of an admirably-collated reference book of this character increases more than in proportion to the comprehensiveness of the information that it supplies.

LOCOMOTIVES OF THE GREAT NORTHERN RAILWAY (IRELAND). [Compiled and published by J. T. Sanders, Station House, Brixworth, Northants. Price 6d.; post free 7½d.] We are afraid we cannot speak so appreciatively of this four-page pamphlet, which purports to give the numbers, names, classes, and chief dimensions of the locomotives of the above-named railway. The particulars given are very incomplete, and in places inaccurate also. For example, the only dimensions given are those of cylinders and driving wheels, and in several instances these are omitted; designers' and builders' names and date of construction are given with some engines and not with others, while a more important omission is that of an entire class of 4-4-0 engines (Nos. 12, 42, 44, 50 and 129), built to Mr. Clifford's designs, and introduced in 1911. As regards the errors, the 4-4-2 tank class consists of five engines, and not two as shown; No. 174 (4-4-0 express) is named *Carrantuohill*, not *Carrantoul*, and was built in 1913, not 1915; not to mention various other mistakes. A reference compilation of this character, in order to have any value, should be both complete and accurate, and we should recommend the compiler to study the pamphlet just previously reviewed, or the admirable little book of the Great Western Railway, before again attempting anything so ambitious on his own account.

OTHER BOOKS RECEIVED.

THE MASTER OF MERLAINS, by David Whitelaw; THE KEY OF GOLD, by L. G. Moberly. [1918. Ward, Lock and Co., Ltd., Salisbury Square, London, E.C.4. Price 5s. each.] These two novels are equally well suited to wile away the tedium of a tiresome journey, or for holiday or home reading. In " The Master of Merlains " Mr. David Whitelaw has developed a stirring romance, which fires the imagination and keeps the reader keenly interested. Mr. Moberly's book, " The Key of Gold," appeals to those who like a love story of the conventional type. One can safely predict for it a considerable measure of appreciation.

Digitized by Google



British Locomotive Practice and Performance.

To the forthcoming October issue of the RAILWAY MAGAZINE Mr. Cecil J. Allen will contribute his hundredth illustrated article on the subject of British Locomotive Practice and Performance. As many RAILWAY MAGAZINE readers will remember, the series was inaugurated in September, 1901, by the late Mr. Charles Rous-Marten, and speedily obtained a world-wide popularity. Other contributors to the series have been such notable railway writers as Mr. J. F. Gairns, Mr. R. E. Charlewood, and Mr. W. J. Scott, but not even the late Mr. Charles Rous-Marten reached the number of contributions that have been made by Mr. Cecil J. Allen. The article in the forthcoming October RAILWAY MAGAZINE will be of a special character, profusely illustrated, and it will include particulars of Mr. Allen's record runs on British railways. A portrait of the author will be given.

Reference to the vast vogue Mr. Allen's writings have obtained is perhaps superfluous, as his name and merits long ago became "familiar as household words" wherever students of railway locomotive work foregather, but we are confident that many thousands of RAILWAY MAGAZINE readers will join with the management of this periodical in heartily congratulating Mr. Allen on his achievement.

United States Railroad Administration.

BY Presidential Decree of December 26th, 1917, the main systems of the United States railways were from that date operated by the U.S. Government, co-relation being established by the appointment of one of the leading officials of each line as "Federal Manager" for the Government. Since that date several committees have been at work arranging the altered train services and other activities so as to avoid duplication of trains and routes, ticket offices and other ordinary competition business, the better employment of freight and passenger cars, and the standardisation of rolling stock with a view to effecting national economies.

The organisation is divided into Central and Regional, the former comprising the main headings:—Law, Finance, Capital Expenditures, Operation, Traffic, Public Service and Labour. The Regional, especially as regards operation, embraces with certain sub-divisions three grand territorial groupings viz., Eastern, Southern and Western.

In so far as the passenger service is concerned, great reductions of mileage have been effected, a very radical change of schedules going into effect on June 2nd last.

The following particulars of the Western District are typical, where the new time-tables provide for an aggregate annual reduction of 11,728,000 train miles in the Chicago Pacific Coast through trains. This economy has been effected by abandoning duplicate service between Chicago and the Pacific Coast cities, and assigning to the short and direct routes to each city the fastest through service.

Under this plan the "Santa Fé" Railway is the preferred route to Los Angeles; Chicago and N. Western, Union and Southern Pacific, to San Francisco; Burlington, Northern Pacific, to Portland; Chicago, Milwaukee and St. Paul, to Seattle. The fast trains will make the run in 72 hours to each city. There will be a secondary train with all classes of carriages scheduled in 78 hours. The other transcontinental roads will operate such service as may be necessary to accommodate their intermediate business on reasonable schedules.

On the same date the mail trains will be so arranged as to give a parity of mail service to and from Chicago and the rival commercial centres on the Pacific Coast. These trains will consume 63 hours enroute. (This compares with the fastest passenger services to the date of change and mail services of 49-60 hours.)

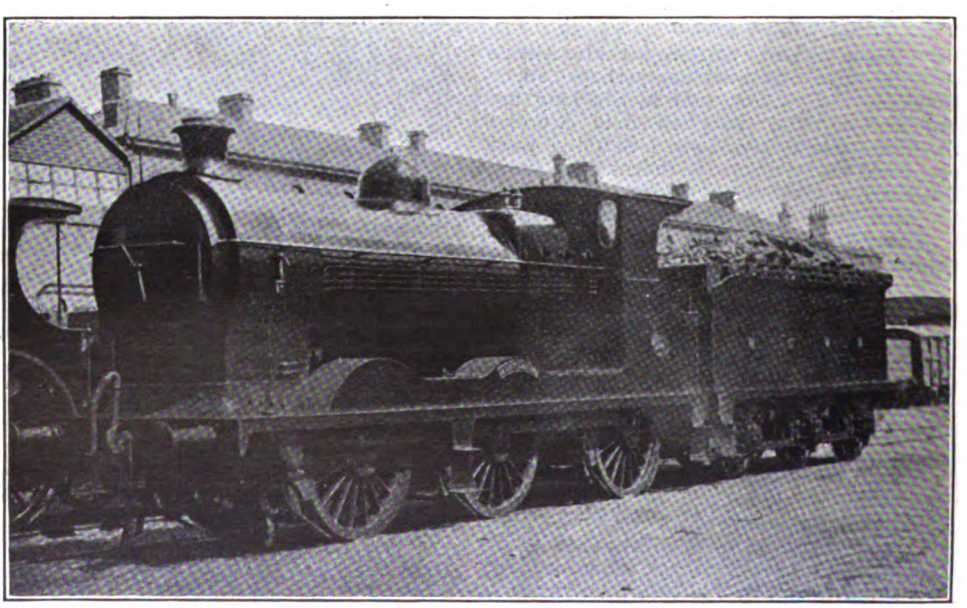
The passenger committee for the South Western and Southern Districts are now engaged in preparing schedules for these areas with a view of similar economies.

Other restrictions are the closing down of duplicate ticket offices, and the removal from time-tables and public notices of the announcement of competitive facilities such as dining car catering, trains-de-luxe, shortest and scenic routes, etc. Also the running of through cars is very much curtailed, and the number of stops increased on account of the fewer trains run.

Digitized by Google

Irish Mail Train Services.

A multiplex question on the Irish mail train services was recently put to the Postmaster-General in the House of Commons by Mr. Ffrench, who asked what amount of subsidy had been paid by his Department for the acceleration effected within the past 26 years of the mail trains on the Dublin and South Eastern Railway line in connection with the mail boat to Kingstown; whether this subsidy was still continued; whether there would be any objection from a postal standpoint to the morning down mail train being started at the same time as the morning down mail trains on the Great Northern, the Great Southern and Western, and the Midland Great Western Railways; whether he required the mail trains on the Dublin and South Eastern Railway to stop at all the small stations on the journey, or whether these stations, including those only 3 or 4 miles apart, could now be served with mails in the same manner as before the recent changes; whether the extreme time between the arrival of the down mail and the return of the up mail for English letters for the country generally had been reduced, so that Belfast lost 1 hour, Cork last 1 hour 25 min., Galway lost 1 hour 55 min., and Wexford lost 4 hours; whether the margin of time in Wexford had been reduced from 7 to 3 hours; whether this reduction was virtually twice as much as that made in Galway, three times as must as that in Cork, and four times as much as that in Belfast; and whether, in view of the inconvenience suffered by the commercial, industrial and professional classes concerned and of the apparently unfair differentiation against Wexford, Enniscorthy and New Ross, and provided that the special local Committee appointed for the purpose of dealing with this question could produce a practical scheme which would not involve increased coal consumption, and produce very slight, if any, inconvenience to the travelling public, he would order a new service by which Wexford would be treated in something like the same manner as the other terminal towns on the main lines out of Dublin? To this Mr. Illingworth succinctly replied: "No question of subsidy arises in this case, for the train alterations to which the hon. member refers were necessary in the national interest, and were carried out on instructions issued by the Irish Railway Executive Committee at the request of the Government. I had no alternative but to accept them. I will consider any suggestion for the improvement of the mail service which does not involve increased consumption of coal or increased expenditure."



Photo] [*J. Macartney Robbins.*

MIDLAND GREAT WESTERN RAILWAY.

0-6-0 locomotive, No. 144, *Australia,* outside shed at Broadstone, Dublin.

This engine and another of its class has been rebuilt with superheater, etc. In due course the other two of the class will be similarly treated.

Digitized by Google

The Leguan and the Locomotive.

BRITISH enginemen are not without their adventures, but they usually arise from fog or other adverse weather conditions, and not from encounters with wild animals or reptiles such as railwaymen overseas sometimes experience.

A correspondent tells in the *South African Railways and Habours Magazine* of an incident which happened some little time ago to train No. 409 at Gatsrand Siding. Waiting there to cross train No. 1328, the driver, on looking round, noticed a commotion amongst some cattle near the fence. The driver, fireman, and guard stepped over to investigate the trouble, and nearing the spot discovered a large reptile, commonly known as a leguan, strutting around amongst some cows, evidently with the intention of getting a drink of milk from them.

The three railwaymen decided to put the leguan out of action, and each one of them let drive with a stone, but the shots were wide of the mark; the second shot from the driver was a bit short of his target, but the stone bounced forward and hit the reptile in the forequarters. This drove the leguan into a violent temper, for he made a leap into the air, wheeled round, and ran towards the fireman. The fireman, not being a keen friend of reptiles, made a terrific sprint for his engine, which he mounted in record time. The leguan, not to be outdone, tried to mount the engine by way of the driving wheel by climbing the spokes, but failed. Altering his course, he ran under the engine, and crept on to the leading bogie centre, and all attempts to dislodge him proved futile.

At Welverdiend Station another attempt was made to dislodge him with a fire-iron, but this was of no avail. At Bank Station another attempt was made by means of flooding him with a hosepipe (to the great delight of a number of sightseers), but this also proved fruitless; in fact, this drenching probably saved his life, counteracting the heat between the cylinders.

On the arrival of the train at Braamfontein an examination of the engine was made by the driver, and behold the leguan was still on the bogie, with head hanging downwards, mouth wide open, and gasping for breath—the heat had evidently proved too much for it. Mr. Wiggell (fireman) secured and extricated the creature in an exhausted condition, and the following day it was presented to the Johannesburg Municipal Zoo, where at present it is the only specimen of the kind, and seems none the worse after eight hours' perilous journey between the underframing of a locomotive engine.

The subject to which the RAILWAY MAGAZINE is devoted not being natural history, we will not supplement this story with an account of the life and habits of the lusty leguan.

Carriage-Paid Goods Traffic.

"Goods carriage paid," the question so ably dealt with by Mr. L. C. Webber Reed in the last May and August issues of the RAILWAY MAGAZINE, has since received attention in the House of Commons. Mr. Lindsay asked the President of the Board of Trade if his attention had been called to a proposal of the Railway Executive Committee that in future all goods train consignments should be forwarded carriage paid; if he was aware that in many trades prices were quoted on the basis of carriage forward, that the adoption of the proposal would mean that articles would have to be recosted, and that the prices of various standard goods had been fixed on the basis of carriage forward by the public Departments concerned; and, seeing that if taken as a whole the adoption of the proposals would cause dislocation to business without any adequate compensating advantage, would he give an assurance that the contemplated step would not be taken? In reply, Sir Albert Stanley stated: "I am informed that the Railway Executive Committee have asked the Chambers of Commerce to appoint representatives to discuss the question of the charges for the conveyance of traffic being paid by the consigner, and that a meeting will probably take place shortly." From the character of Mr. Lindsay's question, it is evident he is a long way from being convinced by the arguments of Mr. Webber Reed. At the same time, there are many who agree with the scheme, and the result of the Railway Executive Committee's discussion will be awaited with interest.

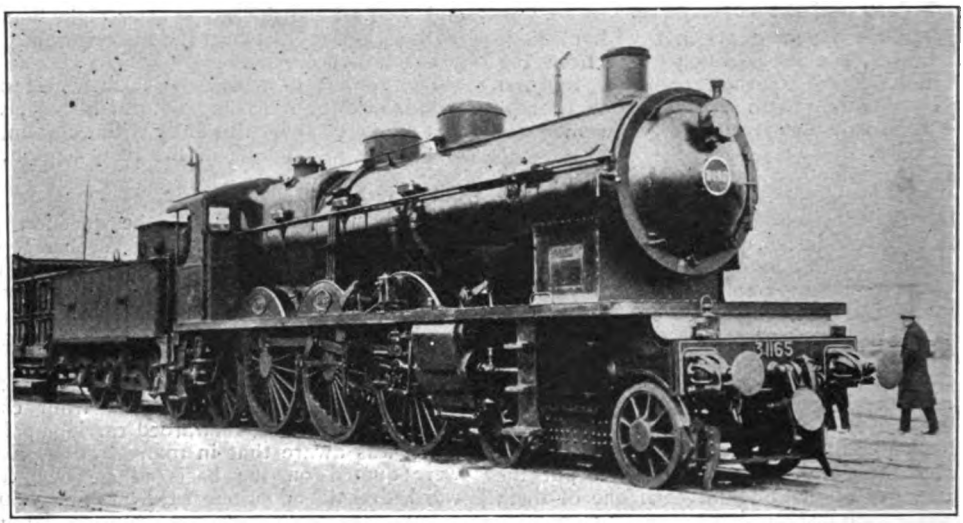
War Time Services on the "Chemins de Fer du Nord."

LYING as it does with almost the whole of its system within the war zone, the Chemin de Fer du Nord has naturally, in company with its neighbour, the "Est," only maintained a sparse service for the benefit of civilian travellers. Until March, 1918, there were four trains each way on the main line between Paris and Calais, and an "up" and "down," in addition, as far as Amiens only:—

		R						R		
10.25	5.55	20.15	16.15	...	arr. Paris	...dep.	23.40	9.10	13.15	19.20
6.30	2.9	18.30	12.30	...	dep. Amiens	... arr.	4.30	10.55	17.15	23.15
5 30	1.20	18.20	11.50	...	arr. do	...dep.	5.8	11.5	18.18	0.16
1.6	21.3	14.10	7.26	...	dep. Boulogne	... arr.	9.35	15.31	22.45	4.45
0.46	20.39	13.48	7.6	...	arr. do.	...dep.	9.54	15.40	23.4	5.1
23 6	18.55	12.10	5.26	...	dep. Calais	... arr.	11.33	17.5	0.43	6.43

Note.—"R" = restaurant car, Boulogne-Paris.

Digitized by Google



Photo] [*W. H. C. Kelland.*

NORTHERN RAILWAY OF FRANCE.

4-6-2 locomotive, No. 3.1165, at Boulogne.

Rather meagre, if one compares it with the pre-war time-tables of this section, bristling with boat and Lille expresses and abounding with such bookings as Paris-Longueau, 79 min., etc.

All trains were slow between Creil and Calais, except the 9.10 down and 12.10 up, which missed ten stations between Calais and Amiens, ran "non-stop" between Amiens and Paris in 1 hour 45 min., or 46.7 m.p.h., and were the only expresses remaining on the Nord.

The best time between Calais Ville and Paris was 7 hrs. 55 min., or 23 m.p.h. while the slowest train only succeeded in averaging 15.4 m.p.h. This last, the 23.40 from Paris, was allowed 2 hrs. 18 min. for the 32 miles "non-stop" to Creil. These trains were invariably very heavy, and almost always worked by the large Pacific engines on the Boulogne-Paris section. With the huge loads taken, even their powers were taxed on the Gannes and Camiers banks.

The fastest run at present on the Nord would appear to be Paris-Persan, 23.1 miles in 33 min., or 39.6 m.p.h., and performed by the stopping trains to Le Treport on the first stage of their 114-mile journey with 35 stops!

Most of the branches have one or two trains each way per diem, and in some cases the R.O.D. supply the motive power over a section of the journey. An example of this was the daily through train from Arras to Etaples, which was at one time regularly worked between Arras and St. Pol by R.O.D. engines (generally a Belgian State 0-6-0 or one of the new 2-6-0 built for the military railways), while on the remainder of the journey it was hauled by a small De Glehn compound.

On the main line the trains have a proportion of bogie corridor coaches, otherwise four-wheelers only are found.

Leave trains are not composed of the most modern stock, nor are they always in the best state of repair. Last winter an officer travelling home found himself doomed to an all-night journey in an ancient P.L.M. four-wheeler minus a door. Halfway the remaining door swung open, hit a signal post, and disappeared in the night. The occupants, however, didn't care. They were travelling in the right direction.

By Rail Between Burma and Siam.

An Indian correspondent recalls the fact that it is nearly a century since Moulmein was established as the first British port in Burma by Sir Archibald Campbell after the conclusion of the first Burmese War. A considerable trade has always existed since then between the two countries during the dry season of the year, though very little has been done by the authorities to encourage it, and the so-called road between Tavoy and Siam lay for one day's journey through the bed of the Tenasserim River and was absolutely unfordable if there happened to be heavy rainfall in the adjoining hills. But our ally in the present war, Siam, was always favourable to the British connection, and even in the dark days of 1857—the Indian Mutiny year—when emissaries were sent to her by the Delhi mutineers, refused to entertain their overtures and ordered them

Digitized by Google

to quit Siam within 24 hours or they would be handed over to the British Consul-General, Sir Robert Schomberg.

Germany, before Siam joined the Allies, endeavoured to make the easy route between Siam and Burma a place to transmit disaffected Indians and arms to Rangoon to stir up sedition in Burma. Fortunately, the British Government was made acquainted with these attempts, and the men were arrested on their arrival at the frontier, tried by a specially constituted Court for their crime, and after a lengthy inquiry, during which every opportunity was given them for calling evidence, found guilty of treason, the ringleaders sentenced to death, and the followers to receive sentences of imprisonment.

The opinion is expressed in *The Indian Railway Gazette* that when the war is over, the question of opening a railway between Moulmein and Siam, *via* Tavoy, will doubtless be taken seriously in hand. It will be a line which will show a good prospect of earning a good dividend, besides being one in the direction towards Singapore—a project which will perhaps receive public attention before the conclusion of the present century.

Turkish prisoners from Mesopotamia are now being employed on the earthwork extension of the Southern Shan States Railway, and from their appearance and demeanour seem thoroughly pleased with their occupation and treatment. The climate is better than that of Mesopotamia, while the regular food and cash payments for work done are experiences they have not hitherto enjoyed, to say nothing of the absence of all risk from shot and shell. It is quite possible that on the conclusion of peace some of these former foes of ours may elect to become British subjects and remain where they are rather than come again under Turkish domination. There is plenty of room for them in the Shan States and Burma, and possibly one reason of their present contentment and satisfaction with their lot is that they find so many of their own co-religionists, happy and prosperous citizens, in no way suffering from the fact of their being Mahomedans in a Buddhist country, living peacefully and unmolested and not under the smallest religious disobligation.

Burma has now some 1,600 miles of railway open through its length and breadth—about 1 mile for every 7,500 inhabitants. It is curious that the part which is the oldest British possession—the Tenasserim division, which includes Tavoy, the largest exporter of wolfram, which has done so much towards assisting the Allies in the war, should be the portion which has been most neglected in the matter of its railway communications.

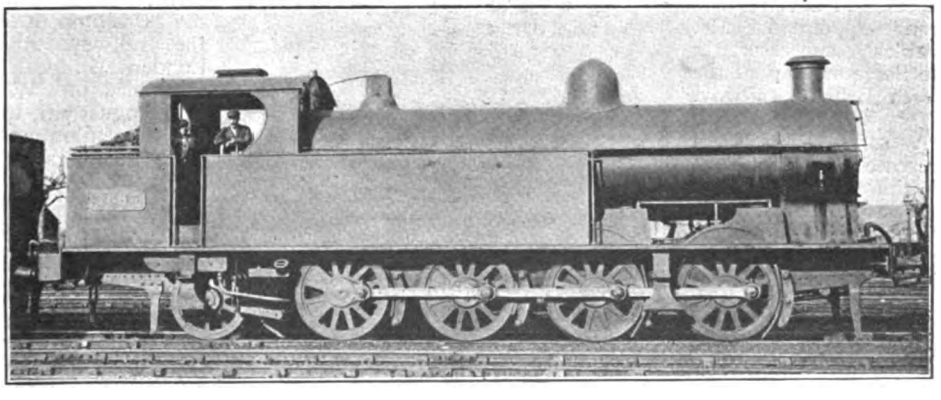


Photo [*P. F. Cooke.*

LONDON AND NORTH WESTERN RAILWAY.

0-8-2 heavy shunting engine, No. 1663, at Speke Junction.

Digitized by Google

We are pleased on this page to insert a portrait of Mr. John Cathles, whose retirement from the service of the North British Railway was announced in the August Railway Magazine. Mr. Cathles is a native of Dundee. He entered the employment of the Great Eastern Railway in the office of the Superintendent of the Line in 1868, until 1871, when he transferred his services to the North British Railway. In 1872 he was appointed staff clerk in the office of the General Manager, attaining the position of chief clerk in 1875, until 1891, when he became indoor assistant to the General Manager. In 1892 he was appointed Secretary. Mr. Cathles is a J.P. of the County and City of Edinburgh, and a Director of the Edinburgh Chamber of Commerce. As previously recorded, Mr. James M'Laren has been appointed Mr. Cathles' successor in the Secretaryship of the North British Railway.

* * *

A salver has been presented by the staff of the Isle of Wight Railway to Mr. H. K. Day, General Manager, in commemoration of his fiftieth year of service with the Company. The salver was made by the Goldsmiths and Silversmiths Company, Ltd. Railway Magazine readers will join with other well-wishers in congratulating Mr. Day upon the attainment of his jubilee.

* * *

In connection with the retirement of Mr. F. J. Webster from the position of Locomotive Running Superintendent of the Great Northern Railway, a complimentary luncheon has been held at the Great Northern Hotel, Peterborough. Mr. H. N. Gresley, the Chief Locomotive Engineer, presided, and Mr. H. A. Ivatt, the former Locomotive Engineer, was present. Many leading officers of the Company attended, and Mr. Webster received a handsomely executed illuminated address, a massive silver inkstand, a War Bond, and a valuable ring for Mrs. Webster. The illuminated address was executed by one of the Company's inspectors at Colwick. Upon it were represented four types of Great Northern Railway locomotives—*i.e.*, a single driver, a 4-4-2, a 2-6-0, and a 2-8-0, one at each corner, whilst surmounting the address itself was a reproduction of a Royal train on the Great Northern Railway, drawn by a large boiler "Atlantic," passing Doncaster.

Mr. John Cathles,
Secretary,
North British Railway,
1892-1918.

* * *

At the request of the Earl of Bessborough, K.P., the Chairman of the Brighton Railway, the railway staff at London Bridge Station assembled on Wednesday, August 7th, to hold in remembrance the 5,064 members of the Company who have joined His Majesty's Forces. His Lordship, in addressing the assembly, said: "We meet again to-day for another anniversary of the war. I regret we could not, as in the two previous years, meet on the actual date, but amongst other reasons was the fact that I was away visiting places of interest connected with the war. Over 5,000 of our men have now joined His Majesty's Forces, representing over 31 per cent. of the staff. A fine record for a railway of our size. Unfortunately, I have to report that we have over 1,000 casualties; 384 men have fallen. I am proud to say 52 of our staff have gained distinctions in the

Digitized by Google

war." Lord Bessborough concluded by asking those present to bow the head in silence for a minute in remembrance of those who had fallen and those who were still fighting on the fields of France and other fronts, and afterwards join together in singing "God Save the King."

* * *

TOTAL number of staff who have left the London and North Western Railway for active service, 30,592, up to June 30th, 1918, or 33 per cent. of staff employed immediately prior to the war. The casualties amount to 10,955, made up as follows:—Killed in action, drowned, etc., 1,445; died from wounds, etc., 741; missing and presumed dead, 290; missing, 202; wounded, sick, etc., 7,739; prisoners of war, 538; total, 10,955. Below is given a summary of the various awards which have been made to members of the staff who have specially distinguished themselves whilst serving with the forces. 503 members of the staff have been brought to notice in this way:—Victoria Cross, 2; appointed Companion of the Order of the Bath, 1; appointed Companion of the Order of St. Michael and St. George, 1; appointed to Distinguished Service Order, 2; Military Cross, 24; Bar to Military Cross, 1; Distinguished Conduct Medal, 71; Military Medal, 240; Bar to Military Medal, 9; 2nd Bar to Military Medal, 1; Distinguished Service Medal, 3; Meritorious Service Medal, 33; Albert Medal, 1; Mentioned in Despatches, 111; Medal and Certificate of Royal Humane Society, 2; otherwise brought to notice for valuable services, 41; French awards, 7; Russian awards, 7; Italian awards, 2; Belgian awards, 13; Serbian awards, 3; total, 575. Several awards have in a number of instances been made to one individual.

* * *

WE record with regret the death of Major Hugh Bell McMinn, D.A., D.R.T., at a Military Hospital in France from heart failure resulting from strenuous duties connected with his position. He was a B.A. of Oxford, and was the youngest son of the late Mr. Robert Inglis McMinn, of Croydon. Major McMinn joined the service of the Midland Railway as a cadet at Whitecross Street Station, London, in November, 1906. He was afterwards at Harlesden, St. Pancras, and Bedford, before being attached to the staff of the Chief Goods Manager at Derby in 1908. He obtained a commission in the Royal Engineers (Railway Transport) in October, 1914, and from that time to the day of his death was in France. He was 33 years of age.

* * *

RECENT railway obituary includes Mr. Jno. W. Farr, who retired in November, 1917, from the service of the Glasgow, Barrhead and Kilmarnock Joint Railway. He began railway life in 1873, and in 1888 became Agent at Glasgow (Gorbals), and afterwards served in a similar capacity at Neilston, Stewarton, Barrhead and Glasgow (South Side). In the railway service he built up a fine reputation for business capability and sagacity, and was thoroughly respected by those who worked under him.

* * *

MR. S. C. LITTLE has been appointed General Manager of the Sligo, Leitrim and Northern Counties Railway, in succession to the late Mr. T. A. Armstrong.

* * *

LORD INCHCAPE has been appointed a Director of the Great Western Railway, in place of the late Mr. Albert Brassey. He is Chairman and Managing Director of the Peninsular and Oriental and British India Steamship Lines, and a Director of the Suez Canal Company, and is this year's President of the Chamber of Shipping. His grasp of

LORD INCHCAPE, G.C.M.G., K.C.S.I.,
Director, Great Western Railway.

railway finance has been sufficiently shown by the masterly report published in 1908 in regard to the finance and working of Indian railways by the Committee of which (as Sir James Mackay) he was Chairman. He was created a peer in 1911. Lord Inchcape was also a member of the Committee appointed in 1905 by the Board of Agriculture to inquire whether a preference was given by English railways to foreign produce conveyed over English lines.

* * *

MR. CHARLES REGINALD BYROM, O.B.E., who has been appointed Assistant Superintendent of the Line, London and North

Digitized by Google

Western Railway, in succession to the late Mr. W. M. Turnbull, was born in November, 1878, at Frankby Vicarage, Cheshire, and was educated at Shrewsbury School. He entered the Company's service at Leamington Spa in September, 1896, and after serving in the various departments of the District Superintendent's office at Birmingham, was appointed Outdoor Assistant to

MR. C. R. BYROM, O.B.E.,
Assistant Superintendent of the Line,
London and North Western Railway.

Mr. (now Sir Robert) Turnbull, Superintendent of the Line, in September, 1901, and was stationed in Birmingham. In December, 1907, he became Assistant District Traffic Superintendent of the Central Wales and Swansea Division, and in August, 1911, Assistant District Superintendent of the Southern Division, Euston, whilst in November of the following year he was appointed Goods Train Assistant to the Superintendent of the Line.

* * *

WE regret to announce the death of Mr. John Rees, J.P., Superintendent of the Swansea Division of the Great Western Railway, which took place at his residence, Upland Crescent, Swansea, on August 6th. Mr. Rees was the senior Divisional Superintendent in the service of the Great Western Railway, and was in his 64th year. He was a native of Llanelly, and entered the railway service at that place in November, 1867. In July, 1869, he was removed to Swansea, and later in the same year was transferred to the Superintendent's office at Neath. His natural ability marked him out for promotion, and in July, 1876, he was appointed station-master at Pembrey. Less than four years later he was transferred to the Superintendent's office at Swansea. In November, 1881, he became Chief Clerk to the Divisional Superintendent and District Goods Manager at Llanelly, and in September, 1894, was appointed Chief Clerk to the Divisional Superintendent and District Goods Manager at Penzance. On the retirement of

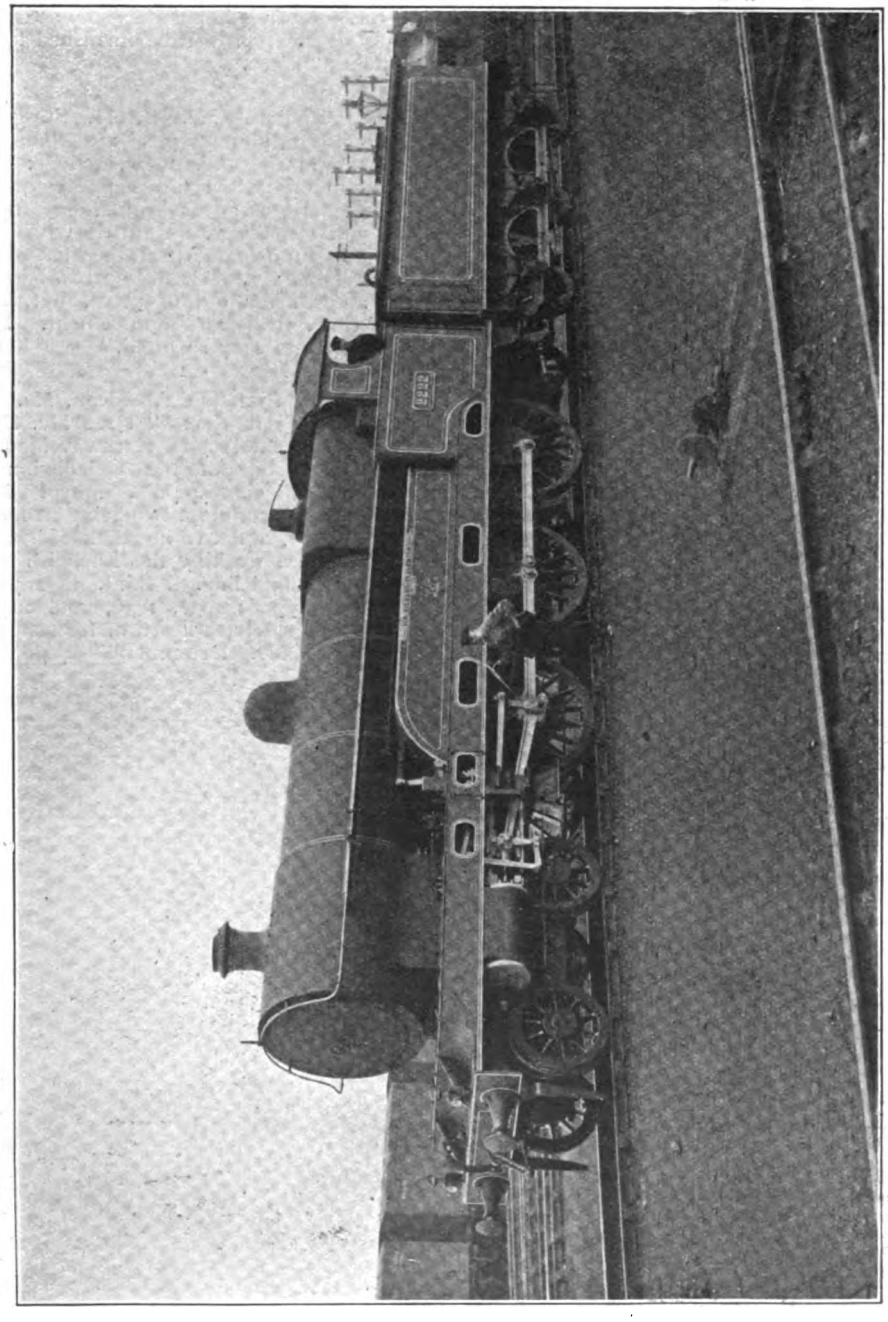
THE LATE MR. JOHN REES, J.P.,
Swansea Divisional Superintendent,
Great Western Railway.

Mr. Peach, a month later, he was appointed Divisional Superintendent and District Goods Manager for the Penzance Division, and eighteen months later he received still further promotion to the post which he held to the time of his death, viz., Divisional Superintendent at Swansea.

* * *

AN interesting question has arisen concerning the terrace on the original Temple Station, open to the public under the Metropolitan District Railway Act, 1864, and closed in 1873 at the instigation of the Commissioner of Police, owing to complaints as to the conduct of persons resorting to it. From a report of the Parks Committee of the County Council, it now appears the view is taken by the District Railway that the public right to use the roof of the present station has not been preserved. It is recommended, therefore, that application be made to Parliament for powers, vesting in the Council, on behalf of the public, the right to use the roof of the station and the accesses thereto, and enabling the Council to make regulations for their control and management.

Digitized by Google



LONDON AND NORTH WESTERN RAILWAY.
"Claughton" locomotive, No. 2222, being prepared for its day's work.

Digitized by Google

A TRAVEL concession recently made by the Railway Executive Committee for the benefit of men who have been disabled in war service is one that will receive the sympathetic approval of all RAILWAY MAGAZINE readers. Instructions have been issued to all British railways under the Committee's control regarding the carriage by rail of invalid or mechanical chairs in possession of men who have been disabled as a result of injuries received during the war. Bath, invalid, mechanical, etc., chairs accompanying disabled soldiers and sailors will be charged at 25 per cent. of the ordinary public rate, with a maximum charge of 2s. This arrangement will apply to discharged men in civilian dress as well as to men in uniform. When men are in civilian clothes they must produce to the railway authorities their discharge papers, or, alternatively, an identity certificate from the Local War Pensions Committee signed by the Secretary to the Committee. The concession has also been granted to officers.

* * *

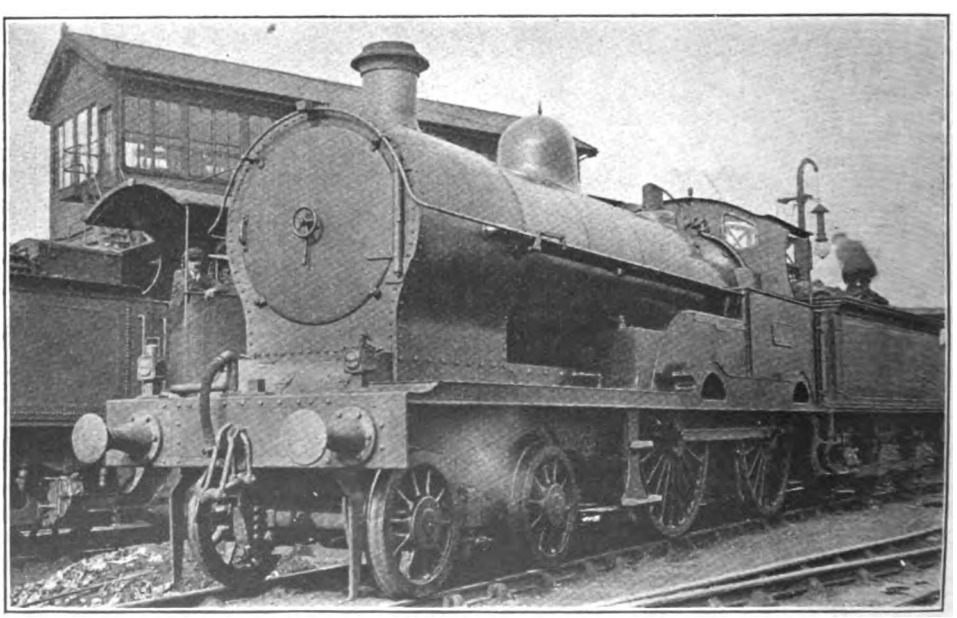
IN connection with the Institution of Locomotive Engineers (London), the Leeds centre is arranging a visit to the works of the Leeds Forge Company on September 3rd. Members will meet at the Leeds Forge offices at 2 o'clock. The offices can be reached either from Holbeck Station, by walking up Armley Road, or from any of the Leeds stations by taking a Bramley, Rodley, Stanningley, or Pudsey car, all of which pass the doors. Mr. A. T. Houldcroft, Hon. Secretary, writing from the Leeds Forge, states all interested are cordially invited, and immediately on receipt of replies indicating the number it is possible may attend, full details of the tour will be furnished to each intending visitor.

* * *

FROM Radlett, Mr. F. H. Stingemore, whose train photographs are familiar to RAILWAY MAGAZINE readers, writes :—"The large Tilbury Baltics are reappearing on the Wellingborough goods trains, repainted in their old red livery, but fitted with typical Midland funnels. After the large wide-topped Tilbury funnel, the narrow-bore Midland affair looks out of place, but, at the same time, it is an improvement. I have seen 2103 and 2107 so fitted."

* * *

IN a letter from Old Aberdeen, Mr. David L. Thomson remarks :—"I see Mr. Dunbar mentions, in the August RAILWAY MAGAZINE, that he saw one of the Caledonian 'old Oban bogies,' class 4-4-0's. May I say that all ten are still running, two being at Dundee, two at Oban, and two at Kirtlebridge, while the others are working the Lochalsh section of the Highland line. I think the 2-4-0 1479 is now scrapped; 1030, 1036, and 1046 are the only ones I have heard of for some time. Several of Mr. Drummond's 4-4-0's have

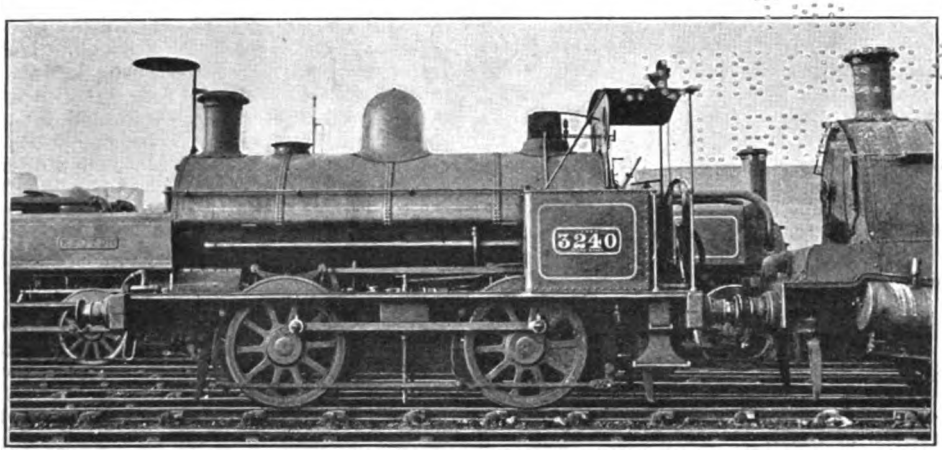


Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.

4-4-0 "Queen Mary" type locomotive, No. 2507, *Miles Macinnes* (now superheated), at Manchester.

Digitized by Google



Photo] [*P. F. Cooke.*

LONDON AND NORTH WESTERN RAILWAY.

0-4-0 saddle tank shunting engine. No. 3240, at Edge Hill.

been scrapped or are condemned. Might I correct Mr. Zamorski's list of sheds of the 1898 'Dunalastairs'? 778 is at Polmadie, and not at St. Rollox. Six new 0-4-0 tanks, numbered 294-9, are in progress, and I believe the number of new goods engines will be increased to 24. I have also heard that the new N.B. goods now appearing will number 35, 20 from the Atlas and 15 from the Hyde Park Works, both of the North British Locomotive Company."

* * *

From Bath Mr. L. B. Hewett writes:—"It was interesting to read in the August article on the Brecon and Merthyr Railway some details of the more recent history of the G.W.R. Company's 4-4-0 tank engine, No. 1490. Like the 4-6-0 goods locomotive, No. 36, this engine was not multiplied. I never saw any published dimensions, but her size was not exceptional. In general appearance she resembled the same Company's 2-4-0 tank engine, No. 1, with a leading bogie, instead of a pair of leading wheels. I select this engine for comparison, as No. 1490 resembled her in possessing outside bearings to the coupled wheels. The bogie, in accordance with the then standard practice on this line, had also outside bearings. The cab was open at the back, and the boiler was of the old domed pattern. The domeless boiler was not reintroduced on the Great Western till the following year. I never saw this engine hauling a through train, but for some time she was regularly employed each evening on shunting work at the Bath goods yard, afterwards returning light to her shed."

* * *

From Mr. C. Williams, the latest Crewe news is to the effect that "Precursor" class 4-4-0 engines, No. 469, *Marmion*, No. 688, *Hecate*, No. 802, *Gaelic*, No. 1363, *Brindley*, No. 1439, *Tiger*, and No. 2064, *Jason*, have all been superheated, but without extended smokeboxes or other external modification. The latest 0-8-0 superheater goods engines completed at Crewe are Nos. 757, 829, 894, 1107, and 1435. Further changes in the "Claughton" sheds consist in the transference of No. 1345, *James Bishop*, from Crewe to Carlisle, and the return of No. 1567, *Charles J. Cropper*, to the latter shed after a brief sojourn at Crewe. The title of No. 1039, *Guy Calthrop*, of the same type, has been altered to *Sir Guy Calthrop* in conformity with the well-merited honour recently bestowed upon that gentleman in recognition of his services as Coal Controller.

* * *

A Sunday train is being run on the M.G.W.R. It leaves Broadstone at 10.45 a.m., runs non-stop to Mullingar, and thence all stations to Galway; connections with Sligo, Westport, etc., are made. The return train arrives at Broadstone at 6.10 p.m. in connection with the cross-Channel boats."

* * *

Following the remarks made by Mr. E. A. Gurney-Smith on page 198 of the Railway Magazine, March, 1918, as to the advisability of developing every source of water power, a correspondent in Ceylon comments as follows:—"I doubt whether the N'Eliya and Kandy Lakes would have sufficient depth to make them of any use as regards power, but it is a shame that all the water power of the St. Clair Falls should be wasted."

* * *

We are informed that the Grand Trunk Railway is receiving delivery from the Ameri-

Digitized by Google

can Locomotive Company of 10 Mikado type locomotives for use in freight service. These powerful engines can handle a freight train of 6,000 tons. Ten locomotives of similar type have recently been received by the Grand Trunk from the Canadian Locomotive Company at Kingston. There are now more than 100 of these powerful locomotives in use on Grand Trunk lines. Other motive power is under order for the Grand Trunk, including 25 switch engines from the Montreal shops of the company. New steel rail is also being received by the Grand Trunk Railway system under the plan of the Dominion Government for setting aside part of the production of the rolling mills for apportionment among the railroads of Canada. The Grand Trunk will receive during the season new steel for about 200 miles of track.

* * *

A LEADING German periodical has recently published an article on the proposed Channel Tunnel, in which it says, in effect, that should the tunnel be constructed, in view of the illusory nature of an eternal friendship with France, which it implies, the peace negotiations should embrace a stipulation by England that her forces should permanently occupy the outlet to the tunnel, namely, the Pas-de-Calais, in the interest of the progress of civilisation, which should be the main object of the tunnel itself. If France should consent to the transfer, nothing will oppose the construction of the work. If, on the other hand, she objects, and notwithstanding, England acquires its possession, she will have an unwilling neighbour, and the realisation of a work of civilisation which would bind the friendship of the two nations will meet with difficulty. The paper gives a geographical sketch embodying the tunnel scheme, showing how the German industrial centres will be affected thereby.

* * *

ACCORDING to *The Times* special correspondent at The Hague, Austrian railway workers are suffering severe privations. He quotes from an Austrian paper, which reports that at a mass meeting of railway workers the attendance was so large that an overflow meeting had to be held. Ten deputies were present. The report is censored. Deputy Heine warned the Government against the militarising of railway workers. Another deputy said that the Government promises were inadequate. Two engine drivers declared that engine drivers almost fell off their engines from starvation. A woman, the chairman of the Austrian railway workers' common kitchens, described the distress of railway workers' families, asserting that children were increasingly dying from consumption. A storm of cheers filled the hall when Deputy Müller declared that the railway workers demanded peace above everything in order to end the distress. The rest of the speech is deleted. At the overflow meeting a resolution was adopted stating that the railway workers rejected responsibility for all consequences if the Government did not decide to give effectual help.

* * *

THE Directors of the British Columbia Electric Railway announce that they have received advices by cable to the effect that the management received demands for increased wages and altered working conditions from their employés which would increase the present wages bill by approximately 50 per cent. It was not possible to meet these demands, and the matter was, therefore, referred to a Conciliation Board, but the men went on strike before the award of this Board was given. It was finally decided as a result of a meeting with the Mayor of Vancouver and several leading public bodies that the employés' demands should be paid and the right given to the company to charge a 6 cent fare (in place of six tickets for 25 cents), pending further negotiations. This arrangement was ultimately carried through, and the whole of the company's system has now been reopened on the basis of a 6 cent fare with further additional charges in respect of the outlying districts. It is difficult at present to forecast the effect on the company's earnings of these increased wages and fares, but it is hoped that this solution of a very difficult situation may be found to provide the basis of a workable arrangement.

Digitized by Google

Digitized by Google

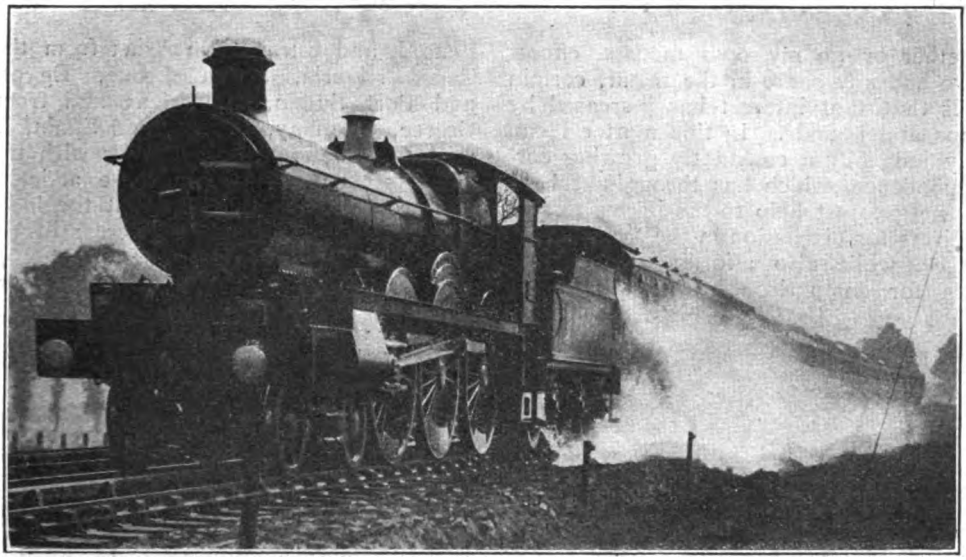
RAILWAY MAGAZINE.

NORTH EASTERN RAILWAY:

Luncheon Car Express passing Low Fell at 55 miles per hour. Engine No. 1147, Class D.

Photograph by E. L. Ahrons.

Digitized by Google



Photo] [*F. E. Mackay.*

GREAT WESTERN RAILWAY.

Down Birmingham express picking up water at Ruislip troughs.
2-cylinder 4-6-0 locomotive, No. 2977, *Robertson.*

British Locomotive Practice and Performance.

ONE HUNDREDTH ARTICLE BY CECIL J. ALLEN.

IT is with a feeling of positive antiquity that I take up my pen in order to write the one hundredth article of this series that it has fallen to my lot to contribute to the RAILWAY MAGAZINE. The first "British Locomotive Practice and Performance" for which I assumed responsibility was that appearing in August, 1909, and it was, I may add, with some fear and trembling that I ventured for the first time to tread in the footsteps of the late Charles Rous-Marten, who initiated the series in September, 1901, and continued his contributions with unfailing ability for nearly seven years until his sudden decease in 1908, his last—the eighty-first of the series—appearing in the May issue of that year. It would be impossible fully to estimate the interest that his writings aroused in this subject. A contemporary rightly remarked at the time of his death: "There has been, so far, only one Rous-Marten, and it is not easy to believe that there can ever be another," and Mr. R. E. Charlewood, who ably succeeded him in the conduct of these pages during the following year, aptly added, by way of comment on that statement, "for few could hope to combine the faculty of observation and accuracy with the strict impartiality which earned Mr. Rous-Marten his unique reputation." When, therefore, I accepted the invitation, first in 1909 to share quarterly in the conduct of these articles with two well-known writers in the railway world —Mr. W. J. Scott, B.A., and Mr. J. F. Gairns—and then, from the commencement of 1911, to assume the entire responsibility for them, it was, I repeat, with extreme diffidence that I essayed the hard task of sustaining the interest in the kindred subjects of locomotive constructional practice and locomotive performance to which Mr. Rous-Marten's popular contributions had given birth.

Since then nine years have passed, and,

Digitized by Google

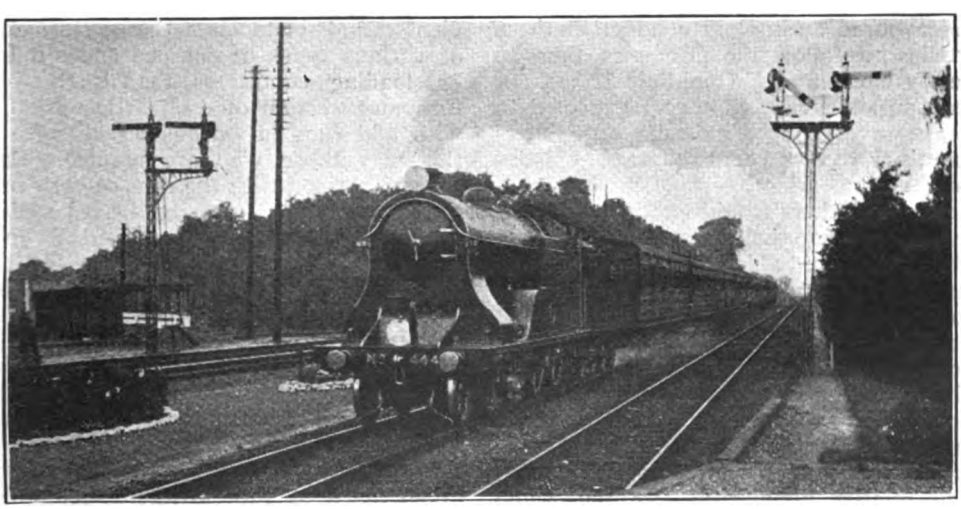
whether or no my own modest efforts have had any share in the result, certain it is that that interest has increased by leaps and bounds. In this matter I can only judge by a constantly growing correspondence, which has throughout been of the greatest help to me in suggesting subjects for discussion in the "practice" pages, while also affording a mass of data for comparison with runs of my own timing in the sphere of performance. There is probably no country in all the world whose locomotives bear greater individuality than those of the British Isles, or whose locomotive work exercises a greater fascination, and perhaps rightly so, seeing that to Great Britain the world owes the genesis of the steam engine. I have received letters from Canada, the United States and the Argentine, in America; from India, Bengal, and Burmah, in Asia; from the Cape, Nigeria, Sierra Leone, Egypt, and Port Sudan, in Africa; and from Greece, Germany, France, and Spain, in our own Continent—all dealing with the subjects touched upon in these articles, and testifying to the fact that the locomotive affections of the writers still remain firmly wedded to the engines of their native country. During the last four years the post-bag has also contained letters from correspondents on active service in almost every theatre of war, and it has been no small pleasure to me to think that in writing my article month by month I may perhaps have been enabled to divert the thoughts and to reawaken the locomotive interests of some of those who are in such unwonted circumstances and surroundings bravely and unselfishly fighting our battles.

MR. CECIL J. ALLEN.

Digitized by Google

The inevitable effect of long-continued correspondence on the writer of a monthly *causerie* such as this is to make him feel that he is communicating month by month with a circle of friends. I am afraid, indeed, that the article itself has now become the only means of communication so far as I am concerned. In the earlier days, when the letters were not so frequent, and there were not such weighty preoccupations in other directions as there are to-day, I always made a point of replying to each communication, but that is now impossible. May I, however, take this opportunity of repeating what I have so often before mentioned in these columns — that *every* letter is welcome from those whose railway enthusiasms I share, and is read by me with unfailing interest? Suggestions for subject matter and discussion in regard to locomotive practice are welcome, and are dealt with as opportunity offers, while I am always pleased to see details of runs which have been timed by readers, and to publish them when publication is practicable, and when they are of sufficient moment. Difficulties also I am prepared to do my best to unravel, provided that they are likely to be of interest to the majority of readers.

I do not think it would be possible to give a better definition of the purpose of these articles than that with which Mr. Rous-Marten commenced the series in September, 1901—206 numbers ago. His desire was, he said, "while giving such an account of locomotive practice in these islands as shall be interesting, and, I hope, informing to engineering readers and other scientific persons, also to non-engineering people connected or associated with railways, to present it, with authentic records of observed work, in such a shape as to be acceptable to readers who do not come under either of these categories. That is to say, I wish to make my notes readable by those who have no special personal interest in railways, either professionally or as a hobby. In other words, I hope to please the railway enthusiast and the casual reader as well as the skilled specialist. This is, I am aware, a 'large order.' Still, I shall try to accomplish it. Secondly, I shall in the present instance depart from a rule which hitherto I have invariably followed when treating generally of the railways of any country—that is to say, the plan of taking them in the order in which they come in 'Bradshaw.' I do so because, while I still deem that rule a good one as avoiding all suspicion of favouritism or undue preference, its limitations would be too stringent under my present plan, and would force upon me the adoption of too prim and didactic a method instead of the more free-and-easy mode which I prefer to pursue in recognition of the object to be kept in view—viz., readable-



Photo] [*H. T. Worlock.*

LONDON AND SOUTH WESTERN RAILWAY.

6 ft. 7 in. 4-cylinder 4-6-0 locomotive, No 444 (before rebuilding), on down Plymouth express, passing Walton.

Digitized by Google

Photo] [*A. J. Luce.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.
Down "Southern Belle" hauled by Atlantic locomotive, No. 39.

ness as well as instructiveness. In short, I approach my subject with an entirely free hand, and, as ever, wholly without prepossession or prejudice, liking or disliking. Everything will be treated on its merits, and on its merits alone, but necessarily on the merits revealed by my own personal study and observation."

So far as has lain in my power, I have endeavoured during my conduct of these articles to follow the principles thus so clearly enunciated. Doubtless it has not been possible, neither have I expected to please everybody; indeed, not infrequently I receive expostulatory epistles from various friends—some mild in character and others frankly and fiercely denunciatory—to the effect that certain altogether estimable lines, which take the premier place in the writers' affections, are not receiving the attention that they merit. In answer to such allegations I can only point to past issues, which bear witness to the fact that, as regards locomotive performance at any rate, space has been accorded to the various companies pretty fairly in accordance with their relative popularity. At the same time, I believe I am right in claiming to have covered more ground than any previous writer of the series. There is barely a single route in this country over which fast running is performed that has not figured in these columns at some time or another, and, as regards the vast majority of main lines, batches of runs at one time over each section have been dealt with. This has generally been my method, as I consider that it is of more value to the reader if I deal thoroughly each month with one or two defined lengths of line, mentioning their gradients, and instancing the performance of various types of engines under different loading conditions, than if the performance section of each article is filled with odd runs in various directions. In this way those who are requiring data for comparison with the runs of their own timing can turn it up ready collated in one issue, rather than dispersed over many, and in this way, also, a better idea is afforded as to the average running over any given section. So much by way of introduction.

It is well to look back over the period which has elapsed since my first article on "British Locomotive Practice and Performance" was written, and to note the revolutionary changes which have taken place in the British locomotive world during these nine years. Principal among them, of course, has been the general adoption of superheating, which in August, 1909, was in its veriest infancy in these islands. Perhaps the Lon-

Digitized by Google

don and North Western Railway affords the most striking example of the revolution that superheating has effected in the operation of express passenger traffic, some 90 4-4-0 engines of the "George the Fifth" type, 90 4-6-0 engines of the "Prince of Wales" type, and 60 4-cylinder 4-6-0 engines of the "Claughton" type, all superheated, having sprung into existence since that date, and constituting, with the 35 "Precursor" class engines also now superheated, a stud of no less than 275 modern and efficient express locomotives. Of these, of course, only the "Claughtons" embody an entirely new design, as the "Georges" and the "Princes" are little more than superheated versions of the "Precursors" and the "Experiments" respectively. The North Eastern Railway has also built extensively, having added the ten large 4-4-0 engines of class R1 and the ten modified "Atlantics" of class V (all of which, although originally working with saturated steam, are now superheated), together with the 50 3-cylinder 4-4-2's of class Z, ten of which were built as non-superheaters, but all of which are now uniformly superheater engines. The North Eastern Company, at the same time, has done a great deal towards superheating existing 4-4-0 types, of the R, M, F and G classes.

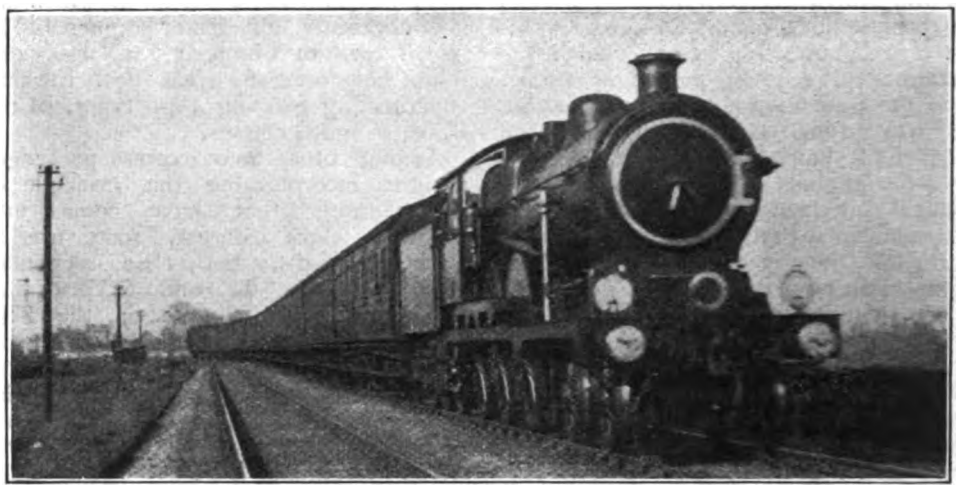
Among other new express passenger designs, incorporating the principle of superheating, that have come into existence since August, 1909, are 40 G.E.R. 4-6-0's, ten Urie 2-cylinder 4-6-0's on the L. and S.W.R., 22 large superheater 4-4-0's on the S.E. and C.R., 10 "Directors" on the G.C.R. together with six 4-6-0's of the "Sir Sam Fay" type and the 4-cylinder engine *Lord Faringdon*, the Pickersgill 4-4-0 and 4-6-0 types and the transferred Highland 4-6-0's on the Caledonian Railway, the large and small-wheeled 4-4-0's on the N.B.R., and 15 superheater engines of class D on the G.N.R. New superheated express types in smaller numbers, in some cases more or less experimental, have appeared on other lines, such as 4-6-0's Nos. 128 and 129 on the G. and S.W.R., the two out-

Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Up express approaching Sevenoaks Tunnel. Large superheater 4-4-0 engine, No. 780.

Digitized by Google



Photo] [*J. Macartney Robbins.*

GREAT EASTERN RAILWAY.
Special (pre-war) restaurant car race train, London to Newmarket, rounding Coldham Curve, near Cambridge.
4-6-0 superheater engine, No. 1510.

side cylinder Highland 4-4-0 engines, the heavy No. 341 (4-4-0) and No. 400 (4-cylinder 4-6-0) on the G.S. and W.R. of Ireland, and the *Carrantuohill* series, with their smaller-wheeled sisters, on the G.N.R. of the same country. Superheated versions of existing types have appeared in the 1452-1461 series of G.N. "Atlantics" and the similar 421-426 series on the L.B. and S.C.R., while two new types during this period built to use saturated steam passed through a steam-drier, but subsequently superheated, have been the 6 ft. 7 in. 4-cylinder 4-6-0's and the large "463" 4-4-0 series of Drummond's design on the L. and S.W.R. Among the few new designs not superheated have been the Drummond large-boilered 4-4-0's on the G. and S.W.R., but these have now been followed by a superheater series. No new express types have appeared on the Great Western, Midland and Lancashire and Yorkshire Railways, although the Midland has rebuilt—or practically renewed—some 160 Johnson 4-4-0's of Class 2, adding superheater equipment, together with about 20 Class 3 4-4-0's, the whole of the ten 999's and half-a-dozen of the compounds. Practically all new engines turned out by the G.W.R. for some time have been Swindon superheater-equipped, and a number of other companies, especially the Great Central, have made good progress in fitting existing types with superheater equipment.

The greatest fertility in design during the period of review, however, has undoubtedly been in the direction of tank engines, many particularly notable examples having been evolved. Of superheater engines there have been 4-6-4 types on the L.B. and S.C. and Midland (L.T. and S. section) Railways, 4-6-2 on the L. and N.W., L.B. and S.C., G.C., and Caledonian Railways, 2-6-4 on the G.C. and S.E. and C. Railways, 2-8-0 on the G.W.R., 4-4-2 on the N.S. and N.B. Railways, 4-4-4 on the N.E.R., 2-4-2 on the L. and Y.R., 0-6-4 on the S.E. and C.R., and 0-6-2 on the G.E.R. On the L.B. and S.C.R. the first superheater 4-4-2 tanks, designed by Mr. Earle Marsh, were already in existence, and their notable work undoubtedly had some share in the rapid spread of the superheating principle, especially on the L. and N.W.R. Non-superheater tank designs introduced during this period have included 4-4-2 types on the N.B., G.N. (Ireland) and Furness Railways, 0-6-4 types on the Barry, G.N. (Ireland) and Highland Railways, the 0-8-4 type on the G.C.R., the 0-8-2 on the L. and N.W.R., and the 2-8-0 on the G.S. and W.R., as well as several others. For so comparatively short a period this catalogue constitutes a remarkable record.

Digitized by Google

Designs for main line goods traffic have also issued in some numbers, and especially of engines for mixed passenger and fast goods service. In the latter connection the most notable examples are embodied in the recrudescence of the "Mogul" wheel arrangement in this country. Of new designs the G.W.R. 2-6-0 type of 1911 now numbers over 150, and the G.N. 2-6-0's 50, all superheated, together with several more on the Caledonian Railway, and Mr. Maunsell's experimental 2-6-0 on the S.E. and C.R., while non-superheated varieties (all new designs since 1909) are in evidence on the L.B. and S.C. and G. and S.W. Railways. Mention must also be made of new superheated 2-8-0 type engines on the G.C. and S. and D.J. Railways, 0-8-0 types on the L. and Y. and L. and N.W. Railways, and 0-6-0 types on the G.E., Midland, G.S. and W., G.N., G.N. (Ireland), Caledonian and other lines. Much more might be written of locomotive progress since August, 1909, did space permit, but this does not purport to be an exhaustive account, nor, indeed, anything more than a brief *résumé* of the revolutionary locomotive developments accompanying the last "century" of these articles, which one can hardly realise until one thus passes them in review.

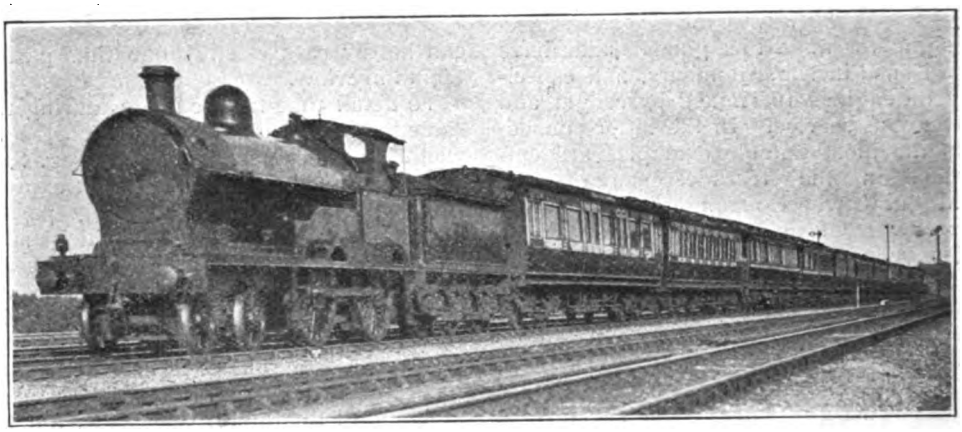
To detail time-table changes during the same period would be too extensive as well as too melancholy an operation. Suffice it to say that in 1909 British express train schedules had apparently passed into a placid channel from which such notable events as the opening of the G.W. short route to Birmingham *via* Bicester in 1910, or the exciting but brief Midland-Great Northern competition to Leeds and Bradford of 1911 failed materially to divert them. So matters continued until the fateful year 1914; but the demands on the locomotives were constantly growing, generally speaking, owing to the spread of the travel habit in the country, and the resultant steady increase of train loads, more especially during the summer months. At exactly the midway point in this period—my fiftieth article, curiously enough, was that of August, 1914—came the beginning of the war. Its effect at first was, on the whole, rather to enhance than to reduce the merit of express locomotive performance, as the result of gradual withdrawals of expresses, coupled with a practically unabated demand for travel facilities, was still further to add to train-

Photo] [*R. Hall.*

GREAT NORTHERN RAILWAY.

Up Leeds express, passing Wymondley. Atlantic locomotive, No. 275.

Digitized by Google



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

Down Liverpool express at full speed. 4-4-0 locomotive, No. 1595, *Wild Duck*.

loads, while as yet schedules had been but little increased. Indeed, in my opinion, some of the locomotive work of 1915 and 1916 was the finest that this country has ever witnessed. But in January, 1917, under the compulsion of circumstances, the high tide of deceleration set in on every hand, and so drastic in the aggregate have the curtailments and slowings been since that date that only one line—the Great Central—is still maintaining schedules which reflect in the least degree the traditional speed propensities of British railways. As a result, point-to-point speeds over main lines generally have dropped from the 50-55 to the 40-45 m.p.h. level, and overall speeds over longer distances from 50 to 40 m.p.h. or less, adding an average of something like half-an-hour, or 25 per cent., to the time occupied on each 100 miles of travel, or even more in cases where many additional stops are made. This may not seem a very large amount, but it is more than sufficient to extract all the "spice" from express locomotive work, especially being coupled, as it has been, with a restriction of maximum speeds on most main lines to 60 miles per hour or less.

The only possible source of refreshment in the realm of performance, therefore, is to look back over the achievements of past years, and as the Editor has kindly allowed me extra space on this auspicious occasion over which to "spread" myself, I propose to detail the finest runs on each main line that it has been my privilege to record over a hundred months and more of timing experience. It has not been easy to make the selection. This will readily be understood when I mention that my average annual mileage for the bulk of this period has been between 40,000 and 50,000, so that the number of "candidates," all with pressing claims for recognition, is very considerable. As regards some lines, on which the general level of performance has been high, it is impossible to avoid inserting two runs with equal claims to the distinction. Let me say at once that I do not claim any of these runs to be "records," and it is quite probable that those of my readers who have made a practice of log compilation may be able to match or even to beat them. In some cases, indeed, I have secured intermediate times over short distances which show improvements on the times of the runs detailed, but I have chosen principally those journeys which appealed the most to me on the score of their sustained excellence. It should also be noted that every run was made under ordinary working conditions, and that, save only in a few exceptional cases, no previous communication was made with the driver concerned. All these journeys, of course, have been described previously in these columns, and I am, therefore, contenting myself with giving a full tabular statement of each run, together with a few remarks as to their notable features. Finally, I am going to differ from the late Mr. Rous-Marten in adopting the "prim and didactic" method to which he took

Digitized by Google

exception; that is to say, I shall follow the order in which the various railways appear in "Bradshaw" so as to avoid any suspicion of preference in dealing with their achievements.

First and foremost, therefore, let me commence, and very suitably so, too, with the Great Western Railway, on which, with so many runs of superlative merit, it has been exceedingly difficult to decide on the "super-best" to appear in these columns. I do not think, however, that I have anything to beat the up journey on the 4.11 p.m. non-stop summer express from Taunton to London which appears in table A, even though a little time was lost. In this case it was the abnormal load that lent distinction to the performance of *King Harold*. The fifteen bogies composing it, which, according to G.W. methods, reckoning 10 wheels to a 70 ft. coach, were equivalent to a 71-axle train, were absolutely packed with people, compartments and corridors alike, and I have no hesitation in increasing the tare load of 464 tons to a gross load of 510 tons (previously I believe I gave the load as 530 tons, under a misapprehension as to the weight of certain vehicles) on that account. Yet, apart from delays, very little time would have been lost. Such time as was

Table A.

G.W.R.—TAUNTON-LONDON.

Engine: No. 4030, *King Harold*. 4-cyl. superheater 4-6-0. Load: 60 axles, 464 tons tare, 510 tons full.

Miles.		Schedule. mins.	Actual. m. s.	Speeds. m.p.h.
0.0	Taunton	0	0 00	
5.0	Cogload Junction...†	6	7 55	51
8.0	Athelney...	—	11 05	63¾
13.0	Langport...	—	16 10	
17.2	Somerton	—	21 05	48½
18.5	Charlton...	—	24 45	
22.7	Keinton	—	27 15	61½
27.6	Castle Cary	30	32 20	
31.0	Bruton	—	36 30	
34.4	Mile-post 122¾ ...	39½	41 40	30½
36.3	Witham	—	44 15	68
41.6	Frome ... ...†	—	49 20	30
47.3	Westbury ... ...†	54	56 20	30
51.5	Edington	—	61 40	60
56.0	Lavington	—	66 25	
61.8	Patney	—	73 45	45
64.3	Woodborough ...	—	76 25	59¼
67.6	Pewsey	—	80 20	
72.8	Savernake	80	86 25	48
76.5	Bedwyn	—	90 05	71½
81.4	Hungerford	—	94 15	73¾
84.4	Kintbury...	—	96 50	
89.8	Newbury...	97	101 30	70¼
93.3	Thatcham	—	104 30	
96.2	Midgham	—	107 00	
98.1	Aldermaston	—	108 45	68
101.7	Theale	—	111 55	68
106.0	Reading West ...†	—	117 25	Sig.
106.9	Reading ... ...†	115	119 20	Sig.
111.9	Twyford...	120	125 35	57¾
118.7	Maidenhead	127	132 10	62½

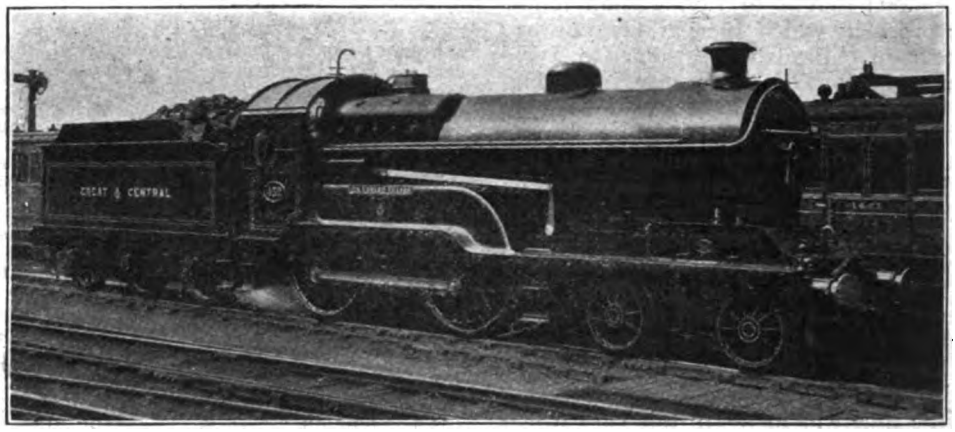
† Service slacks.

Photo] [*R. B. Gamble.*

MIDLAND RAILWAY.

Down Scotch express in the Erewash Valley. 4-4-0 compound locomotive, No. 1005.

Digitized by Google



Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY.

4-4-0 superheater engine, No. 432, *Sir Edward Fraser*, at London Road, Manchester, with Driver Bailey on the footplate.

Miles.		Schedule. mins.	Actual. m. s.	Speeds. m.p.h.
120.4	Taplow	—	133 50	66
124.4	Slough	133	137 30	67
129.7	West Drayton ...	—	142 25	
133.8	Southall	142	146 35	61½
138.6	Acton	—	151 30	Sig.
142.9	Paddington	154	160 20	Sig.

† Service slacks.

dropped on schedule was over sections of impossibly tight booking, such as 6 min. for the 5 initial miles to Cogload Junction, 26 min. for the 25½ miles from Westbury to Savernake, including recovery from a 30 m.p.h. slack and at least 13 miles of fairly steep adverse gradients, and the 5 miles in 5 min. from Reading (passed at 40 m.p.h.) to Twyford. But on so favourable a length as that from Savernake to Reading we should have gained 3½ min., except for delays, together with a further minute from Reading to London, which means that the net time for the whole journey was certainly not in excess of 156 min. Such minima as 30½ m.p.h. at mile-post 122¾, after more than 4 miles rising mainly at 1 in 81-98, the sustained 45 m.p.h. on 5¾ miles at 1 in 222 up to Patney, and 48 m.p.h. after climbing the final 2¾ miles at 1 in 240-153 to Savernake, were really astounding achievements with such a load as this.

As complementary to the foregoing run, let us look at the one in table B on the 4.0 p.m. from Paddington to Birmingham, which demonstrates the extraordinary speed capacity of the same engines under lighter loading conditions.

Table B.

G.W.R.—LONDON-BIRMINGHAM.

Engine: No. 4007, *Rising Star*. 4-cyl. superheater 4-6-0. ¶Load: 28 axles, 206 tons tare, 220 tons full. Driver: Parry.

Miles.		Schedule. mins.	Actual. m. s.	Speeds. m.p.h.
0.0	Paddington	0	0 00	
3.3	Old Oak W. Junc.†	6	5 50	35
4.6	Park Royal	—	8 05	
7.8	Greenford	11	11 35	64½
10.3	Northolt Junction...	—	13 55	
12.1	Ruislip	—	15 40	64½
14.8	Denham	—	18 10	
17.4	Gerrard's Cross ...	—	20 45	57
21.7	Beaconsfield	—	25 00	75
26.5	High Wycombe ...†	30	29 15	35
28.8	West Wycombe ...	—	32 25	
31 5	Saunderton	—	35 45	49
34.7	Princes Risborough.	40	39 05	
40.1	Haddenham	—	43 00	86½
44.2	Ashendon Junction. †	50	46 05	55
47.4	Brill...	—	49 40	Sig.
50.4	Blackthorn	—	53 30	Sig.
53.4	Bicester ... ...*	60	58 20	Sig.
57.2	Ardley	—	62 45	68
62.4	Aynho Junction ...†	69	67 50	52
64.0	King's Sutton... ...	—	69 30	Sig.
67.5	Banbury	74	77 05	Sig.
71.1	Cropredy...	—	81 40	60
76.2	Fenny Compton ...	—	86 30	77½
81.2	Southam Road ...	—	90 25	81¾
87.3	Leamington ... ...*†	94	95 50	30
89.3	Warwick...	—	98 30	57
93.5	Hatton	—	103 05	52½
97.7	Lapworth	—	106 55	69¼
100.2	Knowle ... ...*	—	109 15	63¾
102.1	Widney Manor ...	—	111 00	
105.4	Olton	—	113 45	76½
107.3	Tyseley	—	115 15	Sig.
109.5	Bordesley	—	118 50	p.w.
110.6	Birmingham	120	121 05	

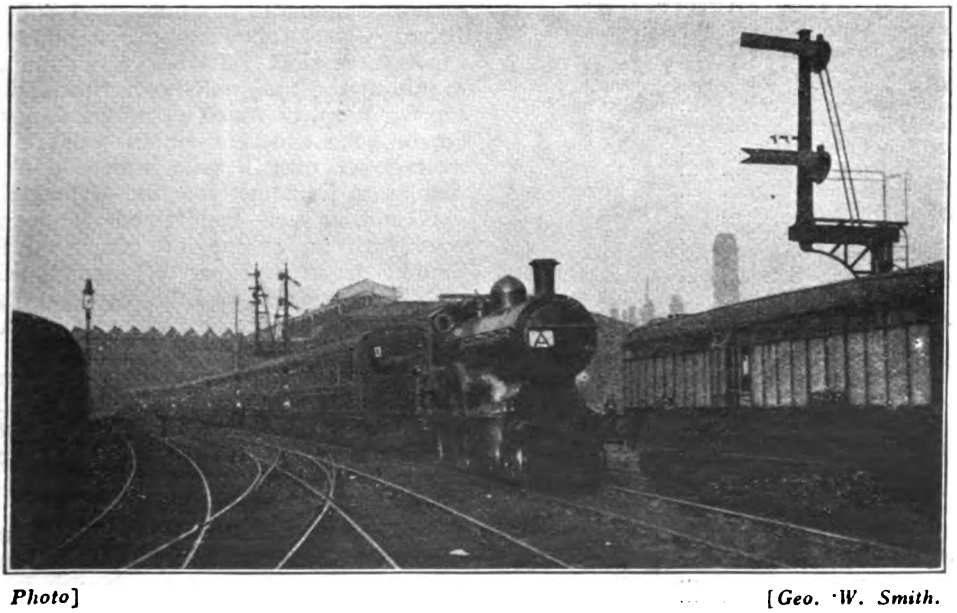
¶ { 24 axles (190 tons) from Bicester.
20 axles (160 tons) from Leamington.
16 axles (130 tons) from Knowle.

* Coach slipped. † Service slacks.

Digitized by Google

This is one of the pluckiest efforts I have ever timed, nothing in the way of delays daunting Parry in his determination to keep schedule time, which he assuredly would have done, and more, but for the final slack over the Bordesley widening works. Until we had passed Princes Risborough nothing very exceptional was done, but the time of exactly 7 min. between there and Ashendon Junction—my record between these points, with its average speed of 81.4 m.p.h. for 9½ miles, and its maximum of 86½—took us through the last-mentioned point 4 min. ahead of time. Immediately following came the crawl from Brill to Bicester behind the Banbury "motor," followed, after a brief maximum of 68 m.p.h. down Ardley bank, by a dead stand for signals beyond King's Sutton and a further check to walking pace through Banbury. Then we went like the wind. The time of 33 min. 35 sec for the 36.2 miles from Copredy to Tyseley, including, as it did, the long 30 m.p.h. slowing through Leamington—observed with exemplary care—and the subsequent ascent of Hatton bank, was substantially the fastest in my experience. Indeed, even though the load had by then been reduced to 160 tons, exceptionally fine work was involved in an acceleration from 30 to 57 m.p.h. in the 3½ miles beyond Leamington (initially favourable for ½-mile, but subsequently rising), and in only falling from 57 to 52½ m.p.h. on the 2½ miles at 1 in 104 constituting Hatton bank. As previously mentioned, this brilliant final effort would easily have recovered all our arrears but for the Bordesley slowing; apart from all checks our net time for the 110.6 miles' journey could not have exceeded 110 min.

Next we come to the London and South Western Railway. Here I was somewhat exercised as to whether to choose a fine run on the 2.0 p.m. down Bournemouth express, on which a 6 ft. 7 in. 4-cylinder 4-6-0 reached Christchurch in 111 min. net with 270 tons, but, in due consideration of the type of engine concerned and the very fair load, I consider the journey detailed in table C as still finer. The train was the 3.30 p.m. from Waterloo, before the introduction of a stop at Templecombe. I was privileged on this occasion to occupy a place on the footplate, and so am unable to say that Driver Bailey was unaware of my recording his times. To anyone who knows this section of the L. and S.W.R., with its 1 in 80 banks, it is obvious that a 55 m.p.h. booking leaves absolutely no margin, and it is only the fact that this route alone of



Photo] [*Geo. W. Smith.*

LANCASHIRE AND YORKSHIRE RAILWAY.

Blackpool express leaving Victoria Station, Manchester. 4-4-0 superheater engine, No. 1110.

Digitized by Google

NORTH BRITISH RAILWAY.
Aberdeen-London express passing St. Fort. 4-4-2 engine, No. 876, *Waverley*.

all those similarly graded is so aligned as to permit of the highest speeds on all declivities that permits of time being kept on so extraordinarily tight a schedule. The succession of maximum speeds clocked on this run bears testimony to this contention, 77½ m.p.h. at Gillingham, 76¼ at Abbey Ford, 80¼ at Sherborne, 75 at Yeovil Junction, 80¼ at Axminster, 81¾ before Sidmouth Junction, and 86½ at Broad Clyst following one another in rapid succession. At the same time 26 m.p.h. at the 152½ mile-post, after climbing 6¼ miles, of which 4½ are at 1 in 70-80, bespoke excellent uphill work. An average of over a mile a minute from Semley to Exmouth Junction—69.3 miles in 68 min. 35 sec.—maintained over such a road with an engine of comparatively limited tractive capacity, undoubtedly calls for comment, and the resultant gain was one of 80 sec. on this most difficult 96 min. booking.

Table C.
L. & S.-W.R.—SALISBURY-EXETER.

Engine: 4-4-0, No. 113. Load: 32 axles, 240 tons full. Driver: Bailey.

Miles.		Actual. m. s.	Speeds. m.p.h.
0.0	Salisbury	0 00	
2.5	Wilton	5 40	
8.2	Dinton	12 30	
12.5	Tisbury	17 45	
17.6	Semley	24 00	43
21.7	Gillingham	27 45	77½
28.4	Templecombe	33 40	76¼
30.8	Milborne Port	36 45	44
34.5	Sherborne	40 10	80¼
39.1	Yeovil Junction	43 50	75
41.3	Sutton Bingham	46 00	51
47.9	Crewkerne	52 40	66
50.5	Hewish Box	56 35	34½
55.9	Chard Junction	61 30	75
61.0	Axminster	65 30	80¼
64.3	Seaton Junction	68 10	
66.7	Mile-post 150½	71 55	33
68.7	Do. 152½	76 10	26
69.7	Do. 153½	78 15	
71.2	Honiton	79 45	
75.8	Sidmouth Junction	83 30	81¾
79.5	Whimple	86 25	
83.2	Broad Clyst	89 15	86½
85.1	Pinhoe	90 45	
86.9	Exmouth Junction	92 35	
88.0	Exeter	94 40	

My experience of London, Brighton, and South Coast work, which I know from various sources to be consistently excellent, is so limited that I doubt if my "best" run on that system, recorded in table D, is really anything much out of the ordinary. But the 4-4-0 engine both climbed well and ran freely at high speeds on the falling 1 in 264 grades; indeed, had Fellingham not "eased" his locomotive considerably after Purley, in order

Digitized by Google

Table D.

L.B. & S.C.R.—BRIGHTON-VICTORIA.

Engine: 4-4-0, No. 71. Load: 24 axles, 160 tons full. Driver: Fellingham.

Miles.		Schedule. mins.	Actual. m. s.	Speeds m.p.h
0.0	Brighton	0	0 00	
1.3	Preston Park	—	3 00	†50
7.1	Hassocks	—	10 30	
9.2	Burgess Hill	—	12 30	73¾
10.0	Wivelsfield	—	13 10	
12.9	Hayward's Heath ...	—	15 45	
16.8	Balcombe	—	19 55	53
21.3	Three Bridges ...	25	24 40	
25.0	Horley	—	27 55	76½
29.0	Earlswood	—	31 25	
32.1	Quarry Box	36	35 05	49½
35.9	Coulsdon	40	39 00	
37.3	Purley	—	40 25	66¼
40.4	East Croydon	45	43 25	
43.5	Norbury	—	47 00	
46.2	Balham	52	50 35	
48.2	Clapham Junction ...	55	53 25	
49.6	Battersea Park ...	—	55 55	
50.9	Victoria	60	58 20	

† At Clayton Tunnel.

to avoid too early an arrival, we might have reached Victoria in 56 min. or less. In this connection it must be remembered that the schedule of this train—the up mid-day "Southern Belle," consisting on this occasion of four 12-wheeled cars—was exceptionally tight to Croydon in comparison with the leisureliness of the subsequent time allowed. Out of several thoroughly good journeys on the South Eastern and Chatham Railway I have chosen one on the short-lived 4.30 p.m. Continental boat express from Charing Cross to Dover (table E) to represent that company. Once again, good though the

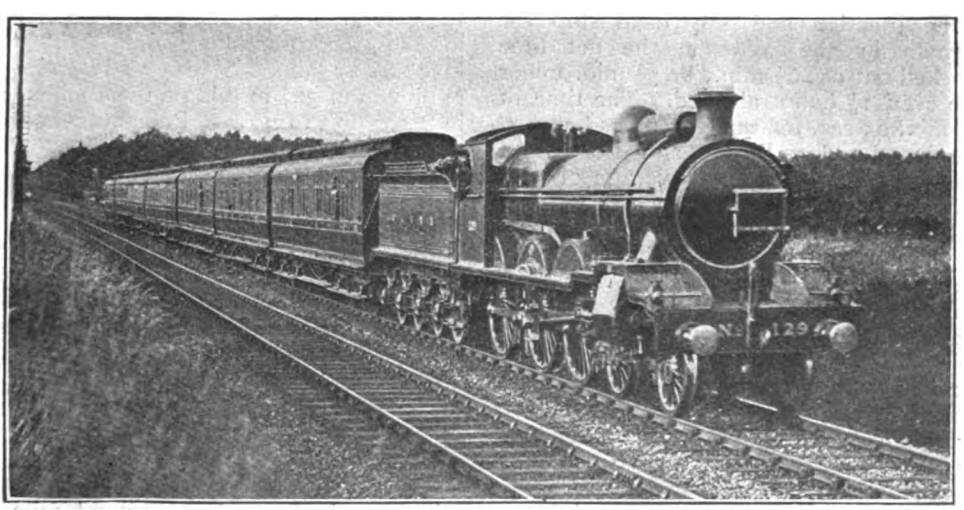
Table E.

S.-E. & C.R.—CHARING CROSS-DOVER.

Engine: 4-4-0, No. 176. Load: 23 axles, 165 tons full. Driver: Smith.

Miles.		Schedule. mins.	Actual. m. s.	Speeds. m.p.h.
0.0	Charing Cross ...	0	0 00	
1.8	London Bridge ...	—	4 45	
4.9	New Cross	—	8 40	56¼
7.1	Hither Green	—	11 10	
8.9	Grove Park	—	13 25	
11.2	Chislehurst	—	16 35	41¾
13.8	Orpington	—	19 55	51¾
15.2	Chelsfield	—	21 40	
16.5	Knockholt	25½	23 30	41¾
20.5	Dunton Green ...	—	27 40	69¼
22.0	Sevenoaks	31½	29 10	57¾
26.9	Hildenborough ...	—	33 55	70¼
29.5	Tonbridge	39	36 35	*
34.8	Paddock Wood ...	—	42 20	67
39.4	Marden	—	46 35	66
41.9	Staplehurst	—	49 00	60
45.2	Headcorn	—	52 10	66
50.5	Pluckley	—	57 40	52½
56.1	Ashford	66	63 30	58½
60.4	Smeeth	—	68 05	
64.1	Westenhanger ...	—	72 25	50½
65.4	Sandling Junction ...	—	73 40	
69.3	Shorncliffe	—	77 30	64¼
70.0	Folkestone Central.	81	78 10	
70.9	Do. Junction.	—	79 35	†
76.5	Dover Town	87½	89 30	‡
77.0	Dover Pier	90	91 20	

* Severe service slack. † Severe signal check.
‡ Signal stop in the Warren.

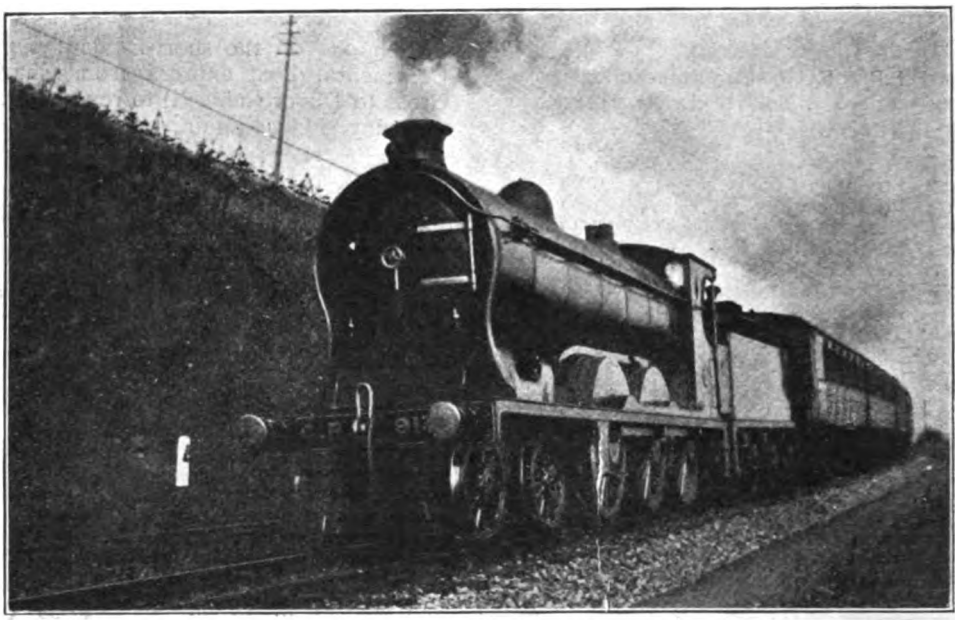


Photo] [*F. E. Mackay.*

GLASGOW AND SOUTH WESTERN RAILWAY.

Glasgow-St. Pancras express passing Rockcliffe.
4-6-0 engine, No. 129, fitted with superheater and Weir feed water heater and pump.

Digitized by Google



Photo] [*J. Cheyne.*

CALEDONIAN RAILWAY.

Dundee-Perth express near Magdalen Green. 5 ft. 9 in. 4-6-0 locomotive, No. 913.

running was, we should have done even better but for passing Tonbridge so well before time. After Headcorn, therefore, we perceptibly slowed up, or we might have breasted Folkestone in 76 min. and reached the end of the Admiralty Pier in 85 min. or less. As it was, after deducting the cost of our slack through Folkestone Junction and the dead stop for signals in the Warren, the net time worked out at 86½ min., or 3½ min. under the even 1½ hours allowed. The time of 73 min. 25 sec. for the 69.1 miles between passing London Bridge and Folkestone Central, with its overall average of 56.7 m.p.h., was a very smart one.

From the south we now move round to the north of London, taking first the Great Eastern Railway. There was some difficulty here in deciding between the claims of several of my runs on the "Norfolk Coast Express," a train which, worked generally by picked drivers, required locomotive work of the very first order of merit, especially when no heavier machines than the 51¾-ton "Claud Hamiltons" were available to work loads varying between a minimum of some 330 tons and a maximum at week-ends frequently reaching over 400 tons. Indeed, I am not at all sure that one of my up journeys behind No. 1809, which gained 1½ min. with a 56-axle train weighing 395 tons, or 7½ times its own weight, ought not to take the place of that given in table F. After consideration, however, I selected No. 1502's work, more on account of its possibilities than its actual achievements, fine though they were. For, after passing Shenfield in the record-breaking time (with this load) of 27 min. 56 sec., maintaining a minimum of 32¾ m.p.h. on the 3 miles of 1 in 84-90 up to Ingrave, Pulham had somewhat to restrain his mettlesome steed in order not to gain too much time on the easy succeeding section to Colchester. We could easily have been through the latter town in 59 min., or less; as it was, our time of just over 60½ min. showed a gain of 3½ min. on schedule. Good work also was done from Ipswich up to Tivetshall, with an acceleration to 55½ m.p.h. up the gradually rising grades to Stowmarket, and a minimum of 37¼ on the 3¼ miles at 1 in 148-131 beyond Haughley, while another fine effort was to fall only from 43¼ to 30¾ m.p.h. in ascending the mile at 1 in 80 and subsequent mile at 1 in 132-150 beyond Whitlingham Junction. Consequently, though in point of fact all but 5 min. were gained on the

Digitized by Google

whole journey, and the net time was about 151 min., with proportionately hard running throughout we might have completed the 130.2 miles' journey in 148 min., representing an average speed, inclusive of the many service slacks and severe intermediate grades, of 52.8 m.p.h. The 90.6 miles between Shenfield and Trowse Upper Junction were covered in 101 min. 19 sec., or about 99 min. net., which is equivalent to a 55 m.p.h. average. This was a remarkable accomplishment over such a switchback road as the Great Eastern, with a 360-ton trainload.

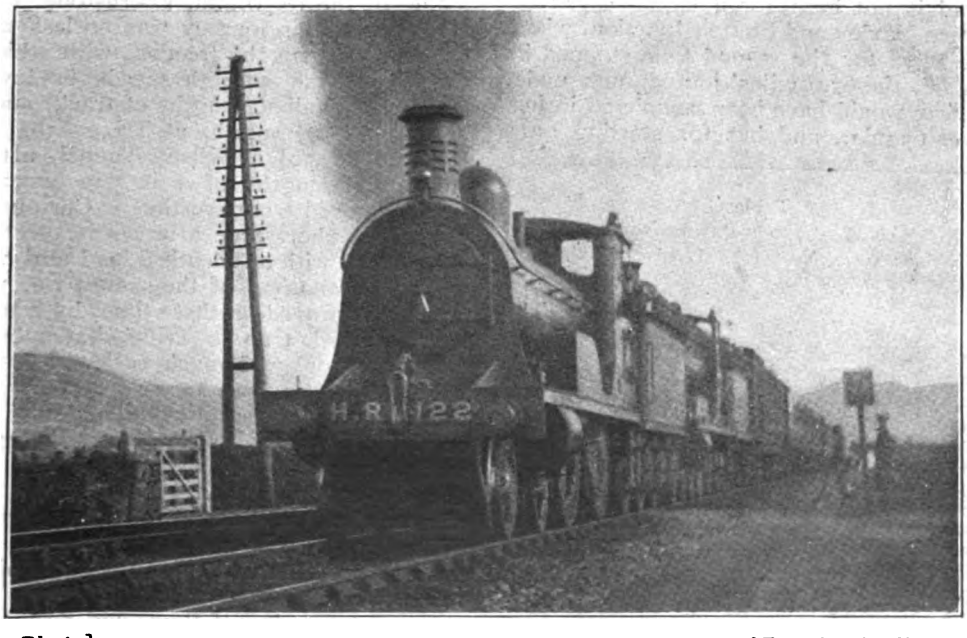
Table F.

G.E.R.—LONDON-N. WALSHAM.

Engine: No. 1502, 4-6-0 superheater. Load: 53 axles, 339 tons tare, 360 tons full. Driver: Pulham.

Miles.		Schedule. mins.	Actual. m. s.	Speeds. m.p.h.
0.0	Liverpool St. ... dep.	0	0 00	
1.1	Bethnal Green ...	—	3 13	
4.0	Stratford... ... ...†	9	7 46	35
7.3	Ilford	—	11 57	
10.0	Chadwell Heath ...	16	14 52	55½
12.4	Romford...	—	17 34	
15.0	Harold Wood ...	—	20 33	54¼
18.2	Brentwood	—	24 45	
19.3	Ingrave	—	26 40	32¾
20.2	Shenfield...	29	27 56	
23.6	Ingatestone	—	31 18	69¼
29.7	Chelmsford ... ...†	39	37 05	45
35.9	Hatfield Peverel ...	—	44 09	
38.6	Witham	49	46 55	64¼
42.3	Kelvedon	—	50 33	
46.6	Mark's Tey	—	55 22	67
51.7	Colchester ... ...†	64	60 32	p.w.
56.0	Ardleigh...	—	66 34	
59.5	Manningtree	73	70 07	70¼
63.2	Bentley	—	73 54	
65.2	Belstead	—	76 20	44
68.7	Ipswich ... ...†	83	80 15	40
71.2	Bramford	—	83 38	
73.6	Claydon	—	86 18	
77.1	Needham	—	90 17	55½
80.6	Stowmarket	97	94 15	
82.9	Haughley	100	96 54	37¼
86.6	Finningham	—	102 15	
91.4	Mellis	—	107 15	
95.0	Diss	—	110 25	75
97.5	Burston	—	112 43	
100.5	Tivetshall	120	116 02	51
104.1	Forncett	—	119 34	
106.7	Flordon	—	122 16	p.w.
109.7	Swainsthorpe... ...	—	125 52	65¼
112.8	Trowse Up. Junction†	—	129 15	25
114.0	Trowse ... ...†	134	131 11	20
114.8	Wensum Junction ...†	137	132 44	20
116.1	Whitlingham Junc...	—	134 46	43½
120.2	Salhouse...	—	141 04	30¾
123.0	Wroxham ... ...†	—	143 56	‡66
127.3	Worstead	—	148 54	
130.2	N. Walsham ... arr.	158	153 09	

† Service slacks. ‡ Reduced to 50 through station.



Photo] *[Tom M. L. Neish.*

HIGHLAND RAILWAY.

Express train leaving Perth for Inverness.
Pilot engine, 4-4-0, No. 122, *Loch Moy;* train engine, 4-6-0, No. 147, *Beaufort Castle.*

Digitized by Google

Table G brings us on to a run between a somewhat curious starting-point and an equally strange destination on the Great Northern Railway. This was actually a journey on the 5.30 Newcastle express *ex*-King's Cross in days long prior to the war; to be precise, it was only the second run I had timed on the Great Northern main line, and it is a source of considerable regret to me that inexperience in the timing art resulted in my omitting to take various running details—maximum and minimum speeds in particular—that I should now like very much to possess. Adverse signals compelled a halt at Cemetery Down Box, just south of Oakleigh Park Tunnel, and it was after the ascent of the ensuing 5.3 miles at 1 in 200 to Potter's Bar that the record-breaking began. Indeed, the time of exactly 52 min. from Potter's Bar to Yaxley, 59.9 miles, is, I believe, the fastest over so long a distance in my experience, with its average of 69.1 m.p.h., and the gradients are by no means favourable throughout. I have certainly beaten the Hitchin-Huntingdon time by one of 21 min. 40 sec. behind No. 1442, hauling all but twice the load; the latter run, however, was otherwise spoiled by delays. Had it not been for a signal check between Yaxley and Fletton Junction, where we were for the second time stopped by signal, the 67.6 miles' journey now under review would have been completed in just over 65 min., and but for starting on a 1 in 200 ascent even this time might have been improved on. On the general "form" displayed on this trip we might, unchecked, have been through Peterborough in 74 min. from King's Cross, instead of the 84 min. allowed.

Table G.

G.N.R.—London-Peterborough.

Engine: 4-4-2, No. 1427. Load: 32 axles, 217 tons tare, 230 tons full.

Miles.		Actual. m. s.
0.0	Cemetery Down Box.dep.	0 00
1.8	New Barnet	4 55
5.3	Potter's Bar	10 05
10.3	Hatfield	15 05
14.6	Welwyn	18 50
17.6	Knebworth	21 50
21.2	Stevenage	25 10
24.5	Hitchin	27 55
28.3	Three Counties	30 45
29.6	Arlesey	31 40
33.7	Biggleswade	34 55
36.7	Sandy	37 20
40.1	Tempsford	40 05
44.3	St. Neot's	43 45
48.6	Offord	47 25
51.5	Huntingdon	49 50
56.1	Abbot's Ripton	54 35
62.0	Holme	59 20
65.2	Yaxley	62 05
67.6	Fletton Junction ... arr.	66 10

Next to claim attention is the London and North Western Railway, where, out of many first-class runs, I had little difficulty in picking out the two, often previously mentioned in these columns, which stand *facile principes*. First comes the astounding effort of *Wild Duck*, shown in table H, which followed on our being "stalled" on Camden bank for 5 min. on a greasy morning through lack of adhesion. Aided up to Chalk Farm by a "pusher" we thus passed Willesden all but 11 min. late, but by dint of superb driving on the part of Greenhalgh the arrears were reduced to 7¾ min. at Tring, 5¼ at Bletchley, 3¾ at Roade, 2½ at Rugby, ¾ at Tamworth, and "0" at Rugeley. Only a final signal check at Crewe South prevented us from reaching Crewe 2 min. early, Greenhalgh having thus gained 13 min. from Willesden with a 410-ton train (all but seven times the weight of the engine) on the fastest non-stop schedule then in operation to Crewe—that of the 10.30 a.m. *ex*-Euston. The climbing on this journey was no less extraordinary than the freedom with which the engine ran at high speeds on level and slightly falling lengths of track, such minima as 56¼ m.p.h. at Tring, 58½ at Roade, and 56¼ at Kilsby Tunnel, after substantial lengths of 1 in 330 ascent, being indeed noteworthy. Curiously enough, a short time afterwards on the same train, with an identical load and the engine *Coronation*, of the same type, we actually improved on these times by 5 sec. from Willesden up to Tring, but subsequent running was much easier, as we were before time all the way. An unchecked run between Euston and Crewe on the basis of *Wild Duck's* record flight would have occupied but little, if anything, over "even time," and it is worthy of note that the time of 145½ min. from Willesden to mile-post 156 showed an average speed of 61.8 m.p.h. over a distance exceeding 150 miles, inclusive of quite a fair number of "ups and downs" and a scrupulous observance of the slacks at Rugby and Trent Valley Junction. In subsequent correspondence with Mr. Bowen Cooke I ascertained the fact that

Digitized by Google

Table H.

L. & N.-W.R.—EUSTON-CREWE.

Engine: 4-4-0, No. 1595, *Wild Duck*, "George the Fifth" class. Load: 54 axles, 389 tons tare, 410 tons full. Driver: Greenhalgh.

Miles.		Schedule. mins.	Actual. m. s.	Speeds. m.p.h.
0.0	Euston ... ... dep.	0	0 00 *	
1.3	Chalk Farm	—	13 20	
5.4	Willesden Junction.	9	19 55	55½
8.1	Sudbury	—	22 50	
11.4	Harrow	—	26 25	
13.3	Pinner	—	28 30	
16.0	Bushey	—	31 25	
17.5	Watford	23	32 55	62½
21.0	King's Langley ...	—	36 25	
24.5	Boxmoor...	—	40 05	
28.0	Berkhamsted	—	43 45	
31.7	Tring	40	47 40	56¼
36.1	Cheddington	—	51 35	76¼
40.2	Leighton...	—	54 50	76¼
46.7	Bletchley...	55	60 10	76¼
52.5	Wolverton	—	64 50	77½
54.8	Castlethorpe	—	66 50	
59.9	Roade	68	71 40	58½
62.9	Blisworth	—	74 35	
69.7	Weedon	—	80 50	66¼
75.3	Welton	—	86 15	56¼
82.6	Rugby ... ...‡	91	93 30	32
88.1	Brinklow...	—	100 20	
91.3	Shilton	—	103 40	60
93.5	Bulkington	—	105 50	
97.1	Nuneaton	107	109 00	75
102.3	Atherstone	—	113 25	
106.5	Polesworth	—	116 55	75
110.1	Tamworth	119	119 50	68
116.3	Lichfield	—	125 20	58½
121.0	Armitage	—	130 00	
124.2	Rugeley	133	132 55	
127.1	Colwich	—	135 35	
129.5	Milford	—	137 50	
133.6	Stafford ... ...‡	143	142 15	40
136.9	Great Bridgeford ...	—	146 25	
138.9	Norton Bridge ...	149	148 40	
143.4	Standon Bridge ...	—	153 40	55½
147.6	Whitmore	—	157 55	58½
150.1	Madeley	—	160 40	
153.3	Betley Road	—	163 20	77½
156.0	Mile-post 156... ...	—	165 25 †	
158.0	Crewe ... ... arr.	171	170 45	

* Dead stand of 5 minutes on Camden Bank.
† Severe signal check, ‡ Service slacks.

the coal consumption on this journey averaged only 33 lb. per mile—a sterling tribute to the design, workmanship, and management of the locomotive.

Altogether contrasting, and yet equally meritorious in character, was the superlative effort of driver Ford on *Sir Gilbert Claughton*, not long after the construction of that engine, made, I must fain confess, after some preliminary instigation on my part. The principal thing to remember in studying table J is that, from starting at Oxenholme, in the middle of Grayrigg bank, to the summit of Shap, there is a vertical rise of approximately 700 ft. Yet No. 2222 negotiated this distance of 18⅝ miles, from a dead start on the grade, in 23 min. 11 sec., at an average speed of 48.1 m.p.h.! The actual start is on 1 in 182 for ⅝ mile; then follow in succession ¾ mile at 1 in 106, ¼ at 859, 1 at 120, 2½ at 133—here the rate of ascent rose to its maximum of 48 m.p.h.—and all but 2 at 1 in 106, on which we fell finally to 46½ m.p.h. A top speed of 75 m.p.h. was then produced by the faintly falling 5½ miles to the foot of Shap incline, 5¾ miles long, on the final 4¼ miles of which, at 1 in 75, we fell to a sustained 38 m.p.h. I have only included the Penrith time as it marked the end of the run, but no hurry was made from the summit, which we had passed with a modest 5 min. in hand. Indeed, the time of this run from leaving Oxenholme to passing Summit was 2 min. 49 sec. under the fastest then scheduled time from *passing* Oxenholme to the latter point, and, as is generally known, the uphill times shown in the L. and N.W. working books over this length of line were not accustomed to err on the side of generosity. It is somewhat interesting to note that, in our ascent of

Table J.

L. & N.-W.R.—OXENHOLME-PENRITH.

Engine: 4-cyl. 4-6-0 superheater, No. 2222, *Sir Gilbert Claughton*. Load: 44 axles, 295 tons tare, 310 tons full. Driver: Ford.

Miles.		Actual. m. s.	Speeds. m.p.h.
0	Oxenholme	0 00	
3⅜	Mile-post 19½	1 33	21.5
7⅝	Do. 20	2 34	31.5
11⅞	Do. 21	4 12	41.7
16⅛	Do. 22	5 35	44.2
20⅜	Do. 23	6 55	46.9
24⅞	Do. 24	8 11	47.9
29⅛	Do. 25	9 27	47.4
33⅜	Do. 26	10 44	46.4
37	Grayrigg	10 54	
37⅞	Mile-post 27	11 54	
38¾	Low Gill...	12 46	
38⅞	Mile-post 28	12 53	63.4
39⅞	Do. 29	13 50	63.2
40⅞	Do. 30	14 44	66.7
41⅞	Do. 31	15 33	75.0
42⅞	Do. 32	16 24	69.2
43	Tebay	16 30	
43⅞	Mile-post 33	17 18	65.2
44⅞	Do. 34	18 14	60.0
45⅞	Do. 35	19 20	51.7
46¾	Do. 36	20 38	44.6
47⅞	Do. 37	22 02	40.2
48⅜	Do. 37½...	22 49	38.1
48⅝	Shap Summit...	23 11	
52½	Penrith	38 10	

Digitized by Google

Shap incline, the train was actually raised 360 ft. between the 31¾ and 37½ mile-posts (*ex*-Lancaster) in 6 min. 38 sec., which is equivalent to almost exactly .9 ft. rise per second against the pull of gravity, in addition to the overcoming of all the usual resistances incidental to motion.

So many of my past journeys on the Midland Railway answer to the appellation of "best" that the selection in this case has been perhaps the most beset with difficulty of any. My choice fell finally on the run tabulated under "K," which was made on the 11.30 a.m. from St. Pancras during the one summer in which it ran to Leeds in 3 hrs. 40 min., inclusive of a conditional (and almost invariable) stop at Luton, and its regular stop at Leicester. So difficult a train was this to work, and so comparatively unpunctual—by Midland standards, at any rate—that to keep time at all necessitated exceptional running, light though the load generally was. Yet we more than kept time on both stages, and this despite the fact that material slackenings were made at a number of points between Trent and Clay Cross, and also at Kilnhurst, beyond Rotherham (I have not shown the running in detail north of Trent on account of the caution required almost throughout), in addition to all the usual service slacks and a bad signal check at Normanton. Our net time from London to Leicester, making allowance for the Luton "conditional," was about 101½ or 102 min., and from Leicester to Leeds it was 106 min. Without the Normanton signal check, but inclusive of severe service slacks at Leicester and Trent, and the many permanent way restrictions beyond, we could certainly have made Leeds non-stop without difficulty in under 3½ hours. It was especially noteworthy to achieve "even time" from the dead start twice in succession, first at Bedford—19.6 miles from Luton in 19¼ min.—and then at the 118¾ mile-post, 19¾ miles beyond Leicester, on a comparatively level track, in 19¾ min. On more than one stage—as, for example, from Bedford to Sharnbrook and from Kibworth to Wigston—time was so well in hand that we did not hurry, or even more notable figures might have been obtained. Perhaps the most remarkable feature of the whole journey was to pass Desborough at 53 m.p.h., and to cover the 9.8 miles from Finedon to that point,

Table K.

MIDLAND RLY.—LONDON-LEEDS.

Engine: 4-4-0, No. 1032, 3-cyl. compound, Class .
Load: 30 axles, 194 tons tare, 205 tons full.

Miles.			Schedule. mins.	Actual. m. s.	Speeds. m.p.h.
0.0	St. Pancras	dep.	0	0 00	
1.5	Kentish Town	...	—	4 00	
3.4	Finchley Road	...	—	6 35	
6.9	Hendon	...	—	10 30	63¾
9.3	Mill Hill	...	—	12 50	
12.4	Elstree	...	—	16 10	54¼
15.2	Radlett	...	—	18 40	71½
19.9	St. Alban's ...	...	23	23 10	
24.7	Harpenden ...	...	—	28 30	
27.3	Chiltern Green	...	—	31 10	
30.2	Luton ...	arr.	35	35 05	
0.0		dep.	0	0 00	
2.6	Leagrave... ...	...	—	4 40	
7.1	Harlington .	...	—	9 00	
10.1	Flitwick	...	—	11 20	77½
11.6	Ampthill... ...	...	—	12 35	79
19.6	Bedford	...	20	19 15	
22.7	Oakley	...	—	22 15	
26.4	Sharnbrook ...	...	—	26 05	
29.6	Summit	...	—	29 40	49½
32.4	Irchester	...	—	32 20	72½
34.8	Wellingborough	...	35	34 20	
38.0	Finedon	...	—	37 15	
41.7	Kettering ...	...	42	41 00	
45.3	Glendon	...	—	45 00	
47.8	Desborough ...	...	—	47 45	53
52.6	Market Harborough		54	52 15	¶72½
56.0	East Langton...	...	—	56 10	
58.6	Kibworth ...	...	—	59 05	
61.2	Great Glen ...	...	—	61 45	65¼
65.1	Wigston	...	—	65 25	
68.8	Leicester ...	arr.	72	70 20	
0.0		dep.	0	0 00	
0.7	Humberstone	Road.	—	2 05	
4.7	Syston	...	—	6 25	
7.5	Sileby	...	—	8 55	
9.8	Barrow	...	—	10 55	
12.5	Loughborough	...	14	13 10	73¾
15.3	Hathern	...	—	15 35	
17.2	Kegworth ...	...	—	17 20	
20.8	Trent	...	22	21 00	†20
34.3	Pye Bridge ..	...	—	37 30	p.w.r.
43.0	Clay Cross ...	...	49	48 55	†40
47.0	Chesterfield ...	...	54	53 25	‡25
63.0	Rotherham ...	...	71	69 35	p.w.r.
77.0	Cudworth ...	...	85	83 25	
86.0	Normanton ...	...	96	93 20	Sig.
97.0	Leeds ...	... arr.	110	108 50	

¶ Reduced to 45 m.p.h through station.
† Service slack. ‡ Tapton Junction.

inclusive of 6 miles mostly ranging in steepness from 1 in 118 to 1 in 136, in the extraordinary time of 10½ min., representing an average speed of 56 miles per hour throughout this ascent.

There has been no difficulty in picking out my Great Central "representative," as the journey set forth in table L was, I cannot deny, a special "stunt" not unconnected with my presence on the train

Digitized by Google

Table L.

G.C.R.—Wycombe-Woodford.

Engine: 4-4-0, superheater, No. 432, *Sir Edward Fraser*. Load: 20 axles, 166 tons tare, 175 tons full. Driver: Bailey.

Miles.		Actual. m. s	Speeds. m.p.h.
0.0	High Wycombe ...	0 00	
2.3	West Wycombe ...	4 40	
5.0	Saunderton	8 05	50½
8.2	Princes Risborough.	11 20	75
			81¾
13.6	Haddenham	15 25	75
17.6	Ashendon Junction.	18 30	8 ¼
19.0	Wotton	19 40	75
21.0	Akeman Street ...	21 10	81¾
23.5	Grendon Junction...	23 10	75
			77½
25.5	Calvert	24 45	71½
			75
31.2	Finmere	29 45	61½
			72½
36.0	Brackley	34 00	61½
39.2	Helmdon...	37 05	72½
42.8	Culworth	40 10	65
44.1	Culworth Junction.	41 10	77½
45.8	Woodford	43 55	Sig.

performed by the mutual consent and co-operation of my friend, Driver Bailey, and his "Director" class engine *Sir Edward Fraser* on the 10 a.m. Bradford express ex-Marylebone. It was one of the fastest "snippets" I have ever timed, seeing that for 16½ miles—from Princes Risborough until a mile before Calvert—our speed lay entirely between the limits of 75 and 82 m.p.h. The uphill work, too, was marvellous, a minimum speed of 61½ m.p.h. being maintained unbroken up long stretches of 1 in 176 grade beyond Grendon. Our net figure of 43¼ min. from High Wycombe to Woodford showed an economy of 5¾ min. on what is normally a tight schedule of 49 min., and I do not expect to repeat again for a long time to come such lightning times as 29 min. 50 sec. for the 35.9 miles from Princes Risborough to Culworth Junction, or 13 min. 25 sec. for the 17.3 miles from Risborough to Calvert, with their respective averages of 73.3 and 78.6 miles per hour.

Two runs under differing conditions are necessary in order to illustrate my best in the way of North Eastern Railway performance. That of table M was a Coal Strike experience of 1912, when the down day "Scotsman" had incorporated the 2.5 p.m. from York to Newcastle, called at Darlington, and was made up daily to fabulous weights. No. 732 had certainly the longest and heaviest train to haul that I have ever yet seen in this country, and magnificently Driver Glass managed his fine machine, as we kept—save for a trifling loss of ¼ min.—the 50 min. schedule then in force to Darlington. This involved the maintenance of 57¾ m.p.h. up 6½ miles at 1 in 626 to Northallerton, and the same rate up 4 miles at 1 in 696 to Eryholme, while maxima of 62½ and 61½ m.p.h. were attained respectively at Thirsk and Danby Wiske on a practically level track, which were remarkable feats indeed in consideration of the load. In the reverse direction No. 1207, then recently superheated, put up some startling performance of the 1.9 p.m. "flier" to York, with its 43 min. schedule for 44.1 miles' run, shown in table N. But for a bad permanent way check right at the

Table M.

N.-E.R.—York-Darlington.

Engine: No. 732, class *Z*, 3-cyl. 4-4-2 superheater. Load: 77 axles, 502 tons tare, 550 tons full. Driver: Glass.

Miles.		Actual. m. s.	Speeds. m.p.h.
0.0	York ... ... dep.	0 00	
1.6	Poppleton Junction ...	4 25	
3.1	Skelton Bridge	6 40	
5 5	Beningbrough	9 45	
9 7	Tollerton	14 30	55½
11.2	Alne...	16 05	60
13.4	Raskelf	18 20	58½
16.1	Pilmoor	21 10	
18.0	Sessay	23 15	55½
22 2	Thirsk	27 30	62⅓
26.6	Otterington	31 45	
30.0	Northallerton...	35 20	57¾
33.7	Danby Wiske...	39 15	61½
37.2	Cowton	42 35	
38.9	Eryholme	44 25	57¾
41.5	Croft Spa	47 25	64¼
44.1	Darlington ... ... arr.	50 15	

Table N.

N.-E.R.—Darlington-York.

Engine: No. 1207, class R, 4-4-0, superheated. Load: 23 axles, 126 tons tare, 140 tons full.

Miles.		Actual. m. s.	Speeds. m.p.h.
0.0	Darlington ... ... dep.	0 00	
2.6	Croft Spa	4 30	59¼
5.2	Eryholme	7 10	65
6 9	Cowton	8 45	68
10.4	Danby Wiske...	11 35	76½
14.1	Northallerton...	14 45	71½
17.5	Otterington	17 40	
21.9	Thirsk	21 05	77½
26.1	Sessay	24 35	73¾
28.0	Pilmoor	26 10	
30.7	Raskelf	28 25	
32.9	Alne...	30 05	77½
34.4	Tollerton	31 15	
38.6	Beningbrough	34 30	80¼
41.0	Skelton Bridge	37 30	p.w.r.
44.1	York ... ... arr.	42 50	

Digitized by Google

finish our time would certainly have been not 43, but 40 min. The outstanding feature of this run was the attainment and maintenance of 80 m.p.h. on a dead level track in the neighbourhood of Beningbrough—an achievement which I have never surpassed or even equalled elsewhere. In all we covered over 21 practically level miles—from Otterington to Beningbrough—at an average speed of 75 m.p.h. on this occasion.

My two outstanding journeys on the Lancashire and Yorkshire Railway are indissolubly linked together as being both made by the same engine on the same day, on the 40-min. Manchester-Liverpool service. No. 1098, a 7 ft. 3 in. 4-4-0, rebuilt with superheater, was the locomotive in question. Taking, first, the westbound run (table O), I was initially somewhat surprised by recording on acceleration from a slack, on the 1 in 84 beyond Pendleton, to 49 m.p.h. After a second bad check at Swinton speed ruled high to Hindley, whence we ran very cautiously across to Pemberton, slacking for the junction, and then accelerating again up the 1 in 91 beyond to 46 m.p.h. But it was the finish of this run that was so tremendously fast, with its maximum of 85 m.p.h. and its average of 77.5 m.p.h. between Upholland and Fazakerley. Over the same length of line, also, the most brilliant running of the return journey (table P) was displayed, 75 m.p.h. being attained at Kirkby troughs on a little easier than level track, while 74 was maintained steadily up 3 miles at 1 in 201-291-235, and after 2 subsequent miles at 1 in 111 we had not fallen below 61½ m.p.h.! Thus "even time" was achieved in just over 14 miles from the start, over a road of which the major portion is on rising grades, and ultimately on a steep ascent. Subsequent delays and very easy running into Manchester disposed of our chances of making an early arrival, but, apart from checks, it should have been a comparatively simple matter, on the eastbound trip as on the westbound, to complete the 36.4 miles journey between the two cities in 35 min., start-to-stop.

For the three concluding runs we must hie us over the Border. On the North British Railway I have not had the good fortune to record any runs of really outstanding merit, my best example probably

Table O.

L. & Y.R.—Manchester-Liverpool.

Engine: 4-4-0, No. 1098, superheated. Load: 16 axles, 120 tons full.

Miles.		Actual. m. s	Speeds. m.p.h.
0.0	Manchester ... ... dep.	0 00	
0.7	Salford	2 20	p.w.
2.3	Pendleton	4 53	49
5.0	Swinton	8 57	p.w.
7.5	Walkden...	11 36	66
11.0	Atherton...	14 35	75
15.2	Hindley	17 58	75
19.3	Pemberton ... ...†	21 50	45
20.9	Orrell	24 01	46
22.3	Upholland	25 35	
24.4	Rainford	27 20	85
29.5	Kirkby	31 13	
31.4	Fazakerley	32 38	
34.1	Kirkdale	34 57	
36.4	Liverpool ... ... arr.	38 13	

† Service slack at junction.

Table P.

L. & Y.R.—Liverpool-Manchester.

Engine: 4-4-0, No. 1098, superheated. Load: 16 axles, 110 tons full.

Miles.		Actual. m. s.	Speeds. m.p.h.
0.0	Liverpool ... ... dep.	0 00	
1.5	Sandhills...	2 55	
5.0	Fazakerley	6 28	69¼
6.9	Kirkby	8 02	75
12.0	Rainford...	12 15	71½
14.1	Upholland	14 10	61½
15.5	Orrell	16 00	p.w.
17.1	Pemberton ... ...†	17 49	45
21.2	Hindley	22 26	50½
25.4	Atherton...	26 33	72½
28.9	Walkden...	29 47	70¼
31.4	Swinton	31 58	p.w.
34.1	Pendleton	35 11	
35.7	Salford	37 47	
36.4	Manchester ... ... arr.	39 33	

† Service slack at junction.

Table Q.

N.B.R.—Edinburgh-Glasgow.

Engine: No. 416, *Ellangowan*, 4-4-0 superheater. Load: 34 axles, 245 tons tare, 260 tons full.

Miles.		Actual. m. s.	Speeds. m.p.h.
0.0	Haymarket ... ... dep.	0 00	
2.3	Saughton	4 45	
4.3	Gogar	7 20	57
7.0	Ratho	10 30	
10.8	Winchburgh	14 30	57
13.3	Philpstoun	17 10	
16.4	Linlithgow	20 05	64¼
18.6	Manuel	22 05	67
21.1	Polmont	24 20	63¾
24.3	Falkirk	27 25	61½
27.7	Bonnybridge	30 40	64¼
30.6	Castlecary	33 30	60
33.3	Dullatur	36 15	
34.7	Croy...	37 45	
39.9	Lenzie	43 20	
42.9	Bishopbriggs	46 45	
44.6	Cowlairs...	50 55	
46.1	Glasgow ... ... arr.	56 30	

Digitized by Google

being the journey on the 4.0 p.m. from Edinburgh to Glasgow, which occupies table Q, the load being a fairly heavy one. Up the faint rise to Philpstoun we maintained 57 m.p.h., and the 20 level miles thence to Dullatur were covered in 19 min. 5 sec.; after that we were so in advance of time that, aided by a signal check beyond Bishopbriggs, and the usual super-cautious descent of Cowlairs bank, we contrived to occupy over 20 min. on the last 12.8 miles. A continuance of the previous effort, however, would have enabled us to pass Cowlairs in 47 min. and reach Glasgow in 52 min., instead of the 58 min. allowed. The Glasgow and South Western run of table R (on the 7.58 p.m. *ex*-Carlisle), I have described in these columns so recently that little further need be said, but it was a thoroughly noteworthy effort, and resulted in a gross gain to engine, on the "crack" schedule of that Company, of no less than 9¾ min. Unfortunately this was one of my earliest G. and S.W. journeys, and I was therefore not familiar with the route, so that details of maximum and minimum speeds are lacking. It is quite evident, however, that the bulk of the time gained resulted from the magnificent uphill work performed, such an average rate as 54.5 m.p.h. from Holywood to Carronbridge, up an unbroken ascent of 14.1 miles at 1 in 200-150, being most exceptional, even taking into consideration the lightness of the load. At the same time, the down-hill speeds were very moderate, as is evidenced by the fact that we gained but little time from New Cumnock to Kilmarnock.

I have chosen the final run (table S) on the popular 8.13 *ex*-Carlisle—the 2 p.m. from Euston—to show how a superheated "Dunalastair II." acquitted herself when faced with the task usually entrusted to the mighty *Cardean*. The respective weights of the two engines, be it noted, are 50 and 74¼ tons, so that, whereas *Cardean* would have been hauling some 5.3 times her own weight, No. 772 was on this occasion tackling a train of all but eight times her own weight. In these circumstances, the work out to Beattock was really phenomenal, taking into consideration that this length includes 21½ miles of adverse grading, 15½ of which are as steep as 1 in 193-203. On the three continuous sections of the latter grade, past Kirkpatrick and Ecclefechan and up to Beattock, we maintained 43½, 44, and 44 m.p.h. respectively. In consequence of this effort, we only lost 2 min. on a booking which even *Cardean*, under such conditions of loading, would have been

Table R.

G. & S.-W.R.—CARLISLE-KILMARNOCK.

Engine: No. 129, superheater 4-6-0. Load: 24 axles, 165 tons.

Miles.			Schedule. mins.	Actual. m. s.
0.0	Carlisle ...	dep.	0	0 00
4.1	Rockcliffe		—	6 40
8.6	Gretna Junction ...		11	11 10
9.6	Gretna Green... ...		12	12 30
11.7	Rigg		—	14 45
14.6	Dornock		—	17 30
17.6	Annan		22	20 15
21.0	Cummertrees		—	23 30
24.6	Rothwell...		—	27 00
29.2	Racks		—	31 20
33.1	Dumfries...	arr.	40	35 40
0.0		dep.	0	0 00
2.4	Holywood		—	5 30
7.6	Auldgirth		—	10 30
11.5	Closeburn		—	14 30
14.2	Thornhill		16	17 25
17.5	Carronbridge... ...		—	21 00
26.1	Sanquhar		—	30 15
29.4	Kirkconnel		—	33 35
36.9	New Cumnock ...		45	41 10
42.2	Old Cumnock ...		—	46 10
44.2	Auchinleck		—	48 05
48.6	Mauchline		56	52 50
56.3	Hurlford		—	59 40
58.0	Kilmarnock ...	arr.	68	62 35

Table S.

CALEDONIAN RLY.—CARLISLE-CARSTAIRS.

Engine: No. 772, 4-4-0, superheated. Load: 54 axles, 375 tons tare, 395 tons full. Driver: Short.

Miles.			Schedule. mins	Actual. m. s.	Speeds. m.p.h.
0.0	Carlisle ...	dep.	0	0 00	
4.1	Rockcliffe		—	7 05	
8.6	Gretna		11	11 45	62½
13.0	Kirkpatrick		—	17 10	43½
16.7	Kirtlebridge		21	21 50	56½
20.1	Ecclefechan		—	25 40	44
25.8	Lockerbie		31	32 05	64½
28.7	Dinwoodie		—	34 50	
31.7	Nethercleugh		—	37 40	
34.5	Wamphray		—	40 35	
39.7	Beattock ...	arr.	45	47 15	†44
0.0		dep.	0	0 00	
10.0	Summit		19	21 25	‡27½
12.9	Elvanfoot		—	25 00	
15.6	Crawford		—	27 35	67
18.1	Abington		—	29 55	64½
23.5	Lamington		—	34 55	66
27.2	Symington		—	38 50	54
28.8	Thankerton		—	40 25	69
30.3	Sig. stop		—	42 15	
33.5	Strawfrank ...	arr.	42	45 15	NET

† Before stop.

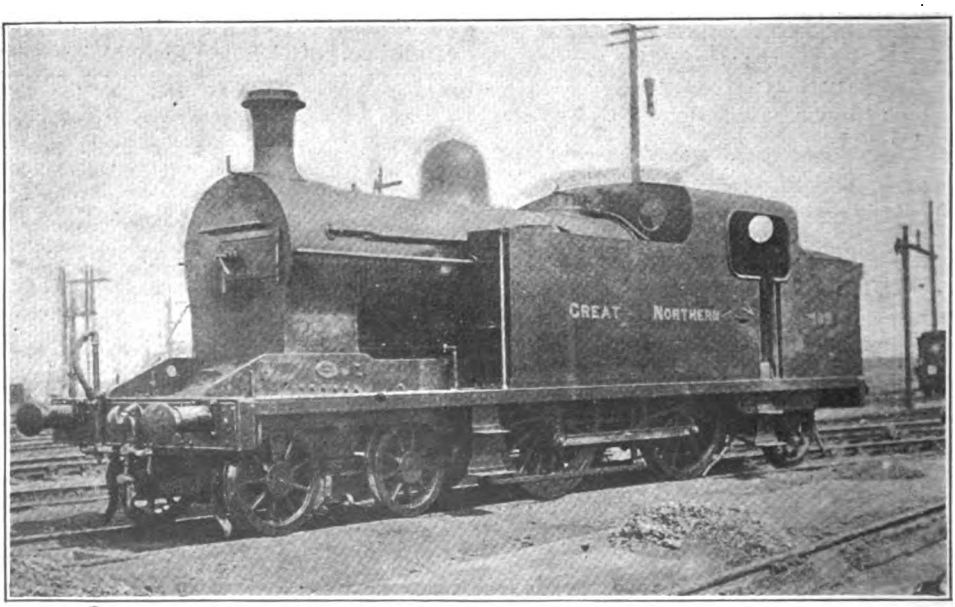
‡ At summit, attained 29 at Greskine.

Digitized by Google

hard put to it to maintain. On the subsequent stage the far greater tractive power of the six-coupled engine was needed on the ascent to Beattock Summit, up which, although, of course, "banked," as usual, we lost nearly 2¼ min., but the loss from there onwards to Carstairs, other than occasioned by the concluding signal stop, was trifling. So plucky an achievement, however, deserves a place among these notable journeys, even though it were not within the powers of the now comparatively diminutive engine exactly to maintain her schedule.

Strictly speaking, I suppose, Irish locomotive running is not covered by the title of these articles, although I would certainly have included my best Irish efforts on this occasion were it not, unfortunately, that I have no immediate personal acquaintance with locomotive performance in the Emerald Isle. I look forward, however, to making that acquaintance at the earliest opportunity, for such running as is now found on the Great Northern and Great Southern and Western lines, in particular, is fit to rank with the best of that performed on this side of the water.

Whether or no the cessation of war will witness a complete or partial return to us of the one-time glories of British express train schedules remains to be seen. That British locomotives are capable of performing a great deal more even than timetables have hitherto demanded is plainly witnessed by the fact that, on the majority of these runs, time was being gained so rapidly that the drivers had materially to ease the running of their engines in order to avoid too great a divergence from their schedules. Furthermore, in the great majority of instances, the engines concerned were by no means of the largest and most powerful types in use on the railways concerned. In any case, the runs here tabulated constitute collectively a magnificent tribute to the express locomotives of Great Britain, and I do not doubt that, if I am privileged in future years to add a second to my first century of these articles, and if during the coming period time-table development is allowed to proceed on a scale commensurate with the constant development of express locomotive tractive power and efficiency in these islands, the second century article will contain a series of runs overshadowing even these peerless achievements.



Photo] [*J. Macartney Robbins.*

GREAT NORTHERN RAILWAY, IRELAND.

4-4-2 tank engine, No. 189, at Amiens Street Shed, Dublin.
These engines work on the Dublin-Howth and Dublin-Dundalk trains.

Digitized by Google

The Croydon and Oxted Joint Railway.

By H. L. HOPWOOD.

LOOKING at a map of the London, Brighton and South Coast Railway, one observes that the system extends over an area which is, roughly, triangular in shape. The easternmost side of this triangle is formed by the line from South Croydon to Eastbourne, line to Eastbourne diverges on the left; and at Crowhurst North Junction there is a further bifurcation, the Joint Line itself turning to the left, shortly to terminate at Crowhurst South Junction with the Red Hill-Tonbridge section of the South Eastern and Chatham Railway;

OXTED AND LIMPSFIELD STATION.

viâ Oxted, Eridge and Polegate, and the northern portion of it—extending from South Croydon Junction to Crowhurst South Junction, a distance of 12 miles 29 chains—is the Croydon and Oxted Joint Railway, owned and worked jointly by the London, Brighton and South Coast and South Eastern and Chatham Railways.

At Selsdon Road Station this line is joined by the Woodside and South Croydon Joint (Brighton and South Eastern and Chatham) Railway, which leaves the latter's Addiscombe Road branch at Woodside Junction, 2 miles 21 chains north of Selsdon Road. At Hurst Green Junction the Brighton Railway's direct whilst south of Crowhurst the line continues as the Brighton Railway branch to East Grinstead.

In its joint ownership of the Croydon and Oxted Joint Railway, the South Eastern and Chatham Railway possesses a route from London to Tonbridge (and certain other stations) alternative to those *viâ* Sevenoaks, and *viâ* Red Hill, and, in addition, some of the trains run *viâ* the Woodside and South Croydon line, and so avoid passing through Croydon Station. There are thus four available routes between London and Tonbridge.

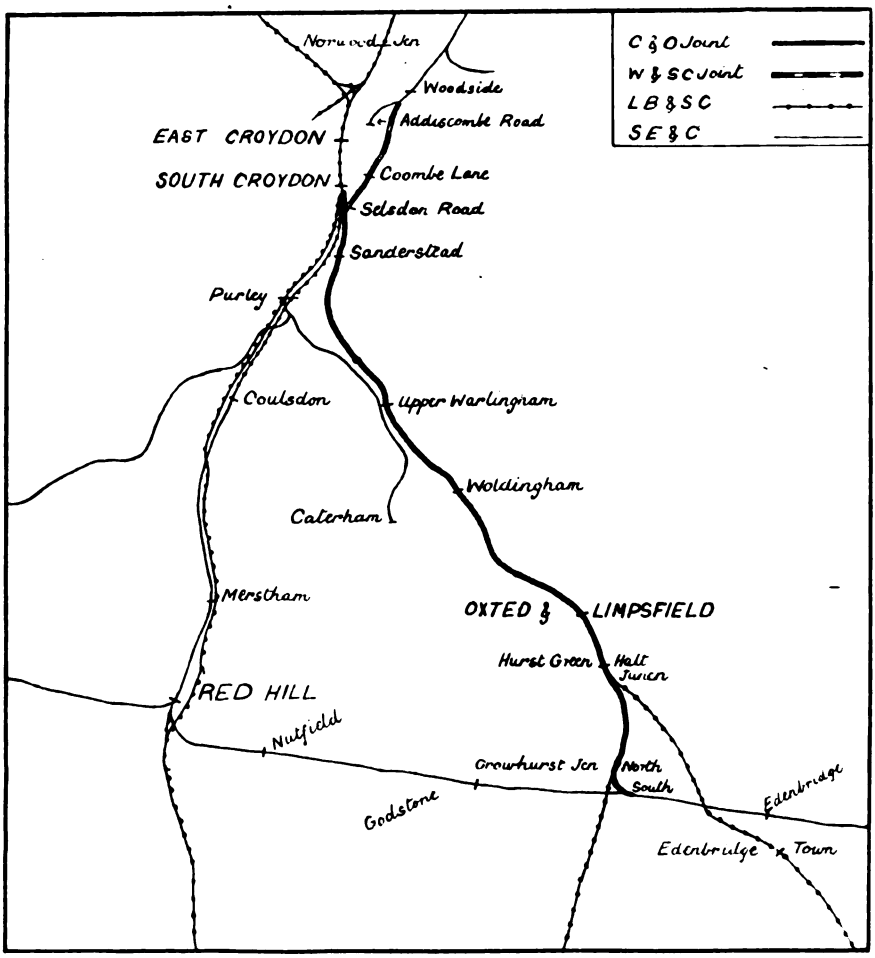
The Croydon and Oxted section also forms part of the direct line to East Sussex stations, and of a second route to

Digitized by Google

Brighton; whilst to Eastbourne, *viâ* Oxted, Eridge and Polegate is the shortest way from London (60 miles from Victoria), though heavy grades and the single line section between Redgate Mill Junction and Polegate render it unsuitable for the passage of express trains.

The Croydon and Oxted Railway and the Brighton Railway's section from Crowhurst Junction to East Grinstead were opened simultaneously on March 10th, 1884. The opening of the Woodside and South Croydon followed, August, 10th, 1885; and in 1888 the Brighton line from Hurst Green Junction was completed—first to Edenbridge on January 2nd, and finally to Groombridge on October 1st.

Although promoted in 1878, the Croydon and Oxted was at that date by no means a new project, for it was originally intended the South Eastern main line should take a course similar to that of the present line. Again, in 1865, a "Surrey and Sussex Junction Railway Company" was incorporated for the purpose of making a line from South Croydon to junctions with the East Grinstead Railway and Uckfield and Tunbridge Wells branches of the same system. This Surrey and Sussex Company was amalgamated with the Brighton Railway in



SKETCH MAP OF THE CROYDON AND OXTED JOINT RAILWAY.

Digitized by Google

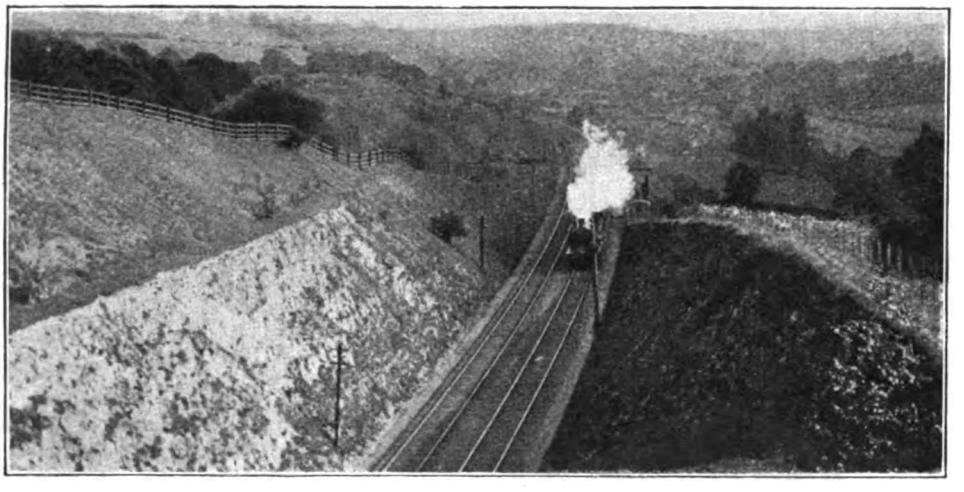
1869 without having built its line, and subsequently the scheme was abandoned, but the Croydon and Oxted now forms the northern half, and the Hurst Green-Groombridge section of the Brighton Railway the southern half, of what was intended to be the Surrey and Sussex Junction Railway.

Situated mostly in cuttings through the chalk, the railway for the first few miles takes a course along the slopes of the Caterham Valley and runs parallel with the Caterham branch of the South Eastern and Chatham Railway, but at a higher level. Considering the length of the line, engineering works are heavy; as apart from the several cuttings, there are tunnels at Riddlesdown, Oxted and Limpsfield; that at Oxted measuring 1 mile 506 yards. Two viaducts of considerable size are crossed—one at Riddlesdown and another south of Oxted Station.

From the start at South Croydon there is a steep ascent, mostly at 1 in 100 and 110 (though 1 in 83 occurs for a short distance) in order to cross the North Downs. Near the summit, where Oxted Tunnel is entered, the Downs attain an altitude of more than 800 ft. Passing through the tunnel, the line next falls at 1 in 132 and 1 in 100 to Oxted Station; then at 1 in 300, 132, 120, 157, 110 and 100 to Crowhurst Junction.

Stations are built mostly of timber, and to a design favoured by the South Eastern Railway 30 or 40 years ago. Selsdon Road has four platforms, two of them serving the Woodside and South Croydon line, as the junction between the two systems occurs south of the station. At Oxted there is a bay on the down side.

Owing to the necessity for reducing passenger train mileage, the Croydon and Oxted line is now worked entirely by the Brighton Railway, the South Eastern and Chatham service having been temporarily withdrawn. Selsdon Road Station is closed, as are also the stations and halts on the Woodside and South Croydon line.



UP LONDON, BRIGHTON AND SOUTH COAST RAILWAY TRAIN PASSING RIDDLESDOWN SIGNAL BOX.

Before the war, there was a very frequent service, as in July, 1914, Oxted was served by 92 trains (49 down and 43 up, Saturdays only trains omitted). The Brighton Railway was the predominant working partner, and provided 67 of the above number. There were also four trains which ran *viâ* Oxted but did not call at any station on the joint line, viz., 3.45 and 6.3 p.m. from Victoria and 8.2 and 9.55 a.m. from Eastbourne. Additional Eastbourne trains by this route were the 11.10 a.m. down and the 6.52 a.m. up. The remaining trains serving Oxted started from, or terminated at, Tunbridge Wells, East Grinstead, Lewes, Brighton, etc., and these included a number of trips

Digitized by Google

made by rail motors which did not work north of Oxted.

South Eastern and Chatham trains numbered 13 from, and 12 to, London, the majority of which worked to and from Edenbridge or Tonbridge. Three each way travelled over the Woodside and South Croydon line, and the down trains (7.30 p.m. *ex* London Bridge and 9.32 and 11.30 p.m. *ex* Charing Cross) did not go further than Oxted. Apart from these six through trains, the Woodside and South Croydon line was worked by a rail motor, which made frequent trips between Woodside and Selsdon Road stations. This line is normally worked alternately every 12 months by the owning companies, the change over taking place on July 1st.

The following is the official table of distances by the Croydon and Oxted Joint Railway :—

	M.	C.
London, Brighton and South Coast Railway—		
East Croydon to South Croydon ...	0	72
South Croydon Station to South Croydon Junction...	0	7
Croydon and Oxted Joint Railway—		
South Croydon Junction...	0	0
Selsdon Road Station	0	23¼
Selsdon Road Junction	0	31
Sanderstead	0	75¼
Riddlesdown Box	2	66
Upper Warlingham	4	53¾
Woldingham	5	66
Oxted Lime Siding Box	8	13
Oxted	8	79
Hurst Green Junction	10	8
Crowhurst Junction North	12	2
Crowhurst Junction South	12	29
South Eastern and Chatham Railway—		
Crowhurst Junction South to Edenbridge, South Eastern & Chatham	2	23¾

Sligo, Leitrim and Northern Counties Railway.

MR. S. LITTLE.

MR. S. LITTLE, who has been appointed General Manager of the Sligo, Leitrim and Northern Counties Railway in succession to the late Mr. T. A. Armstrong, entered the company's service as a junior clerk 17 years ago. During that time Mr. Little has gained the complete confidence of those in authority. In 1909 he replaced Mr. Armstrong in the Chief Clerkship, and during the frequent absences of that gentleman on business or holidays has "carried on" with credit to himself and satisfaction to his directors. No doubt is entertained by those who know him that Mr. Little will fully justify his appointment to the most responsible position in the service of the company, and that its affairs will prosper and its success continue to increase under his experienced guidance and control. With the staff along the whole line the appointment is most popular—in itself a tribute to Mr. Little's tact and judgment in dealing with those under him.

Digitized by Google

Locomotive and Train Working in the latter part of the 19th Century.

GREAT EASTERN RAILWAY. [No. IV.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN the early "eighties" the Great Eastern began to show considerable improvement in its speeds. This may have been partly due to the opening of the joint line to Doncaster, and certainly the best averages were to be found on this section. In 1883 the best express according to Foxwell was timed as follows:—

Miles.			Speed, m p h.
	Norwich (Trowse)	dep. 1.50	
68½	March	arr. 3.17	47¼
		dep. 3.20	
88	Spalding	arr. 3 45	46½
		dep. 3.47	
126¼	Lincoln	arr. 4.34	48¾
		dep. 4.37	
163	Doncaster (ticket platform),	arr. 5.23	48

The longest runs of other expresses were:—

Miles.		Min.	Speed
69½	Liverpool St. to Parkeston Quay	106	39½
68¾	Liverpool St. to Ipswich	100	41¼
56¾	Liverpool St. to Colchester ...	73	42½

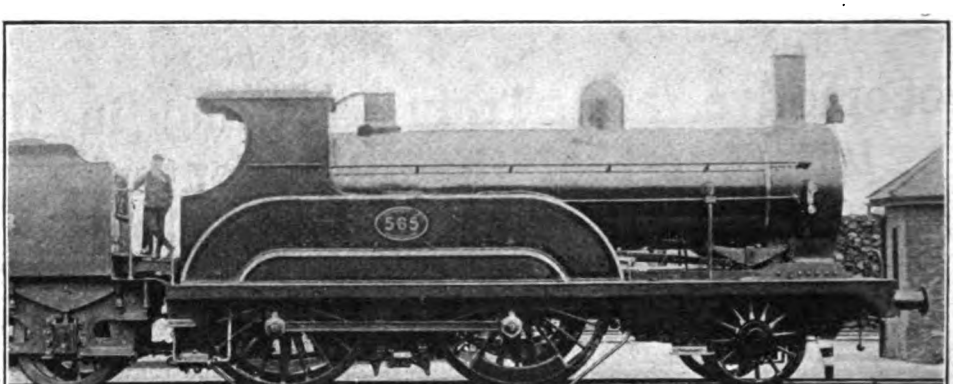
With the exception of the above mentioned Trowse to Doncaster seaside express, even these fell considerably short of the best 1850-1854 runs. But in justice to the Great Eastern it should be added that the trains were usually very heavy, with the exception of the Doncaster expresses, and also that the 6 miles to and from Liverpool Street were even then so crowded with suburban traffic that only reduced speeds could be run over this piece, so that the actual running averages, when the trains got clear of the London area, might be considered to be almost 2 miles per hour better than the above figures. The Continental expresses to Parkeston Quay had to run at reduced speed over the last few miles of their journey. But one virtue the Great Eastern could certainly claim: it was a most punctual line in spite of the many difficulties near London.

In 1882 a new era started in the locomotive designs of this railway, with the advent of the first of the afterwards so numerous 7 ft. coupled engines. The earliest of these, designed by Mr. T. W. Worsdell, and built at Stratford in 1882-3, were Nos. 562 to 571 and 640 to 649. They had 7 ft. coupled wheels, 18 in. by 24 cylinders, and 140 lb. pressure. In certain of their features they struck out a new line; Joy's valve gear was used, and the leading axles were arranged on the Webb radial axlebox system. The splashers were combined in one, a design which Mr. Worsdell afterwards took with him to the North Eastern, though the Great Eastern pattern was certainly to my mind more artistic than the plainer one of the North Eastern.

Taken altogether, the 562 class were certainly very handsome, and for that day very massive-looking machines, and they undoubtedly tackled heavy trains. But when it came to fast running there was an indefinable something about them, which may be expressed that they usually seemed to travel after the manner of a stout lady in a hobble skirt.

This little trait in their behaviour struck me particularly on one occasion, when I travelled south on the 4.48 p.m. from Doncaster. The engine thence to March—the Bromley 7 ft. 6 in. single No. 600—put up a very fine performance, and after a late start gained time the whole way, with one or two spurts of 70 miles per hour. At March 600, full of honours, came off, and 564, one of the 2-4-0 engines, backed on, after which we strolled gingerly across the fens in the direction of Ely and Cambridge. It was my first experience of the class, and I looked forward to something special. I got it, and helped incidentally to form part of one of the most solemn and funereal railway processions that it was

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

2-4-0 EXPRESS ENGINE, NO. 565, WITH JOY'S VALVE GEAR.
Series 562-571 and 640-649. Designed by Mr. T. W. Worsdell. Built at Stratford, 1882-3.
Wheels, 7 ft.; cylinders, 18 in. by 24 in.

ever my lot to endure. It reminded me of the American train on which the immortal Mark Twain proposed that the cow-catcher should be transferred from the front to the rear, because there was no possible chance of overtaking the cow, but, on the other hand, there was no safeguard to prevent the cow from strolling into the train and biting the passengers.

However, I must have pitched upon a bad day. The following run by 570 with 9 coaches and 2 horse-boxes in 1890 was a vast improvement. The train was the 2.13 p.m. from Colchester due at Liverpool Street at 3.25 p.m., a run of 51¾ miles booked in 72 minutes—running average 43.1 m.p.h.

Miles.	Chains.			
		Colchester	dep.	2.15.52
5	4	Marks Tey	pass	25. 6
13	7	Witham	,,	34.42
21	75	Chelmsford	,,	45 18
31	41	Shenfield	,,	57.27
32	55	Post 19 ...	,,	59.28
33	41	Brentwood	,,	3.0.37
		Post 18 ...	,,	0.52
		,, 17 ...	,,	1 53
		,, 16 ...	,,	2.48
		,, 15 ...	,,	3.42
		,, 14 ...	,,	4.38
		,, 13 ...	,,	5.35
		,, 12 ...	,,	6.33
		,, 11 ...	,,	7.33
		,, 10 ...	,,	8.35
		,, 9 ...	,,	9.40
		,, 8 ...	,,	10.46
		,, 7 ...	,,	11.53
		,, 6 ...	,,	13. 0
46	34	Forest Gate... ...	,,	13.50
47	52	Stratford	,,	17. 5
51	55	Liverpool Street...	arr.	3.26.52

A maximum speed of 66.7 m.p.h. was attained at the 15th post, and exactly one minute was gained on the whole journey.

When they were new 562 to 571 were all stabled at Stratford, but 568 to 571 were shortly afterwards transferred to Ipswich. In 1888-9 Nos. 562 to 565 and 567 were stationed in the Lynn district, and replaced the Johnson bogie engines 305 and 306 on the Wisbech—London service. Of the second ten, Nos. 640 to 643, after a short term at Stratford, settled at Ipswich, whilst 644 to 649 went to Norwich. They terminated their careers on various branches, the last of them to be scrapped in 1901, No. 0642, having been for some time at Cromer. One of these engines, No. 644, was in January, 1886, on the 5 p.m. fast train from Liverpool Street, a train followed almost immediately by the 5.3 p.m. local train. The express was pulled up by signals at Manor Park, and the local train ran into it from the rear. After this accident, owing to the closeness with which the 5.3 p.m. followed the express, a dummy van was attached to the rear of the latter train in case of emergencies. This van acted as a deterrent to any special advances on the part of the local train until December, 1897, when the front end of the 5.3 p.m. again made acquaintance with the tail of the express, this time at Devonshire Street. On the latter occasion the van proved very useful.

The next express engines to follow them were the first Worsdell two-cylinder

Digitized by Google

compounds, No. 230 (1884) and 700 to 709 (1885). In addition to the compounding these differed from the 562 class principally in being provided with leading bogies, and in that the boiler pressure was raised to 160 lb. The coupled wheels were of the same size, 7 ft., as in the 562 class, and the high-pressure cylinder was 18 in. by 24 in., the low-pressure being 26 in. by 24 in. They weighed 44½ tons in working order, and the boilers, exactly the same as those of the 562 class, had a heating surface of 1,200 sq. ft.

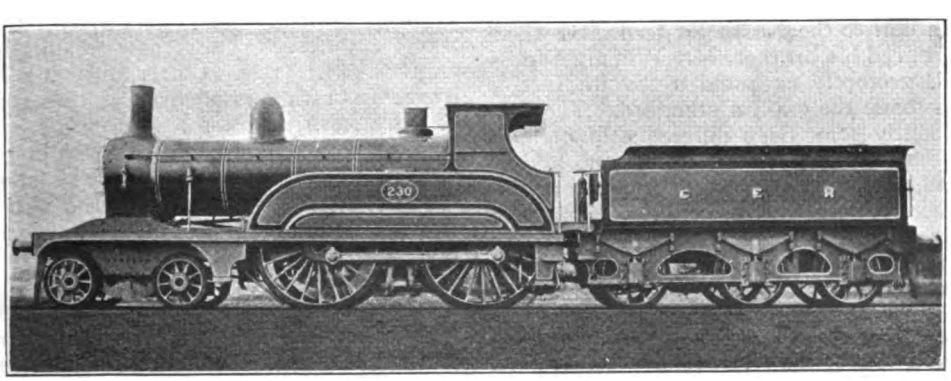
These engines were always stationed at Stratford during the time they remained compound engines, but in 1892 they were all converted to simple engines with 18 in. by 24 in. cylinders, and some time afterwards several were sent to the Lynn district, and 0704 was at Clacton. All were rebuilt in 1894 with extended smokeboxes, and were finally broken up in 1902-1904.

The following is the log of a short run between Bishops Stortford and Cambridge made in 1887 with engine 230 and 9 coaches :—

			Speed, m.p.h.
Bishops Stortford	dep.	6.3.15	
Post 35	pass	10.50	50.7
„ 40	„	16.45	53.1
„ 44	„	21.16	60.
„ 46	„	23.16	63.2
„ 47	„	24.12	62.1
„ 48	„	25.10	58.1
„ 50	„	27.14	56.5
„ 53	„	30.25	
Cambridge (55¾)	arr.	34.0	

The late Mr. Rous-Marten recorded a run with engine 701 on the 6.47 p.m. from Colchester with 18 coaches. The time taken to pass Stratford was 58 min., a mean speed of 49½ m.p.h., the maximum being 64 m.p.h. down Brentwood bank. With engine 702 the same observer on the 4.45 p.m. from Cambridge and a load of 16 coaches timed the train to Bishops Stortford in 32 min., including a slack at Stanstead, a mean speed of 47¾ m.p.h. These two runs with heavy loads were very good performances, but engine 230, with 15 coaches, lost time all the way from London to Ipswich, and could average only 36 m.p.h., with a maximum of 52 m.p.h.

In 1884 the Great Eastern produced at Stratford Works 30 surburban tank engines of the 2-4-2 type, Nos. 650 to 679, which were the prototypes of the present standard suburban tank engines. This railway has oscillated in a somewhat bewildering manner between the 2-4-2 and the 0-4-4 types of tank engines. Mr. Sinclair, as we have already seen, began in 1864 with the 2-4-2 engine, but his successors—Messrs. Johnson, Adams, and Bromley—stuck to the 0-4-4, and put no less than 150 of this type into service, with the addition of a few exceptions of the 0-4-2 variety for country branches. Mr. T. W. Worsdell came from Crewe, where the 2-4-2 type with radial axleboxes had been evolved, and it was perhaps but natural that he should adopt it. To continue the story for a period beyond that at which these jottings have arrived, Mr. Holden, who succeeded Mr. Worsdell, built ten more of the 2-4-2 engines in 1886 immediately after his



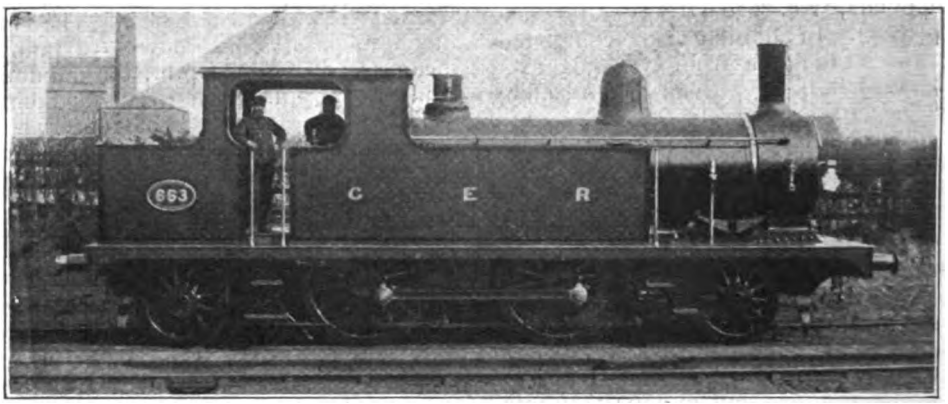
Photo] [*Locomotive Publishing Co., Ltd.*

4-4-0 2-CYLINDER COMPOUND EXPRESS ENGINE, NO. 230.

Designed by Mr. T. W. Worsdell. Built at Stratford, 1884.

Wheels, 7 ft.; H.P. cylinder, 18 in. by 24 in.; L.P. cylinder, 26 in. by 24 in.

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

2-4-2 TANK ENGINE, NO. 663, WITH JOY'S VALVE GEAR.
Series 650-679. Designed by Mr. T. W. Worsdell. Built at Stratford, 1884-5.
Wheels, 5 ft. 4 in.; cylinders, 18 in. by 24 in.

arrival. Then it appeared that the Great Eastern had sufficient suburban tank engines to last them for a long time, and no more were built until 1898, when a return was made to the 0-4-4 variety, of which 40 were produced between 1898 and 1901. I have not intended to include the 40 large tank engines of the 1090 class, which were of a larger type, and classed as "main line" tank engines, although they have always performed a good deal of suburban work.*

In 1904 a return was made to the 2-4-2 type of 1884, and since then very large numbers of these have been built. This question of 2-4-2 versus 0-4-4 tank engines is a very interesting one from a technical standpoint, but cannot be discussed here. Mr. Worsdell took the 2-4-2 with him to the North Eastern, and when he retired his brother, Mr. William Worsdell, promptly executed a "volte face," and made the 0-4-4 a standard. There is evidently some deep difference of opinion on the question of the two types, and it would be very interesting to hear a discussion amongst the leading locomotive engineers on their respective merits. Some have solved the problem by discarding both types in favour of the larger 4-4-2, and from the recent appearance of the two new Great Eastern engines 1000 and 1001 it looks as if the 0-6-2 type were to have a turn on this railway.

To return to Mr. Worsdell's engines of 1884-5, Nos. 650 to 679 had 18 in. by 24 in. cylinders, 5 ft. 4 in. coupled wheels, and 140 lb. pressure, with Joy's valve gear. Their successors differ from them principally in that the cylinders are 17½ in. in diameter, with, however, increased boiler pressure, and a return to the Stephenson link motion in place of Joy's valve gear.

When Mr. Holden succeeded Mr. Worsdell at the end of 1885 he promptly started to settle the shunting engine question. I have already mentioned this subject in an earlier portion of these articles. The deficiency was somewhat glaring; there were at the beginning of 1886 only 15 0-6-0 shunting and goods tank engines on a railway with a total stock of somewhat over 700 engines. The new shunting engines, with 4 ft. wheels and 16½ in. by 22 in. cylinders, began to pour out of Stratford works for some time, and now there are about 230 of them in service. The old days of painful and laborious movements to and fro on the part of retired tender engines on half pay are now over as far as the Great Eastern is concerned.

A variant of these six-coupled tank engines is also used for certain suburban passenger trains—chiefly in the Fenchurch Street area, and on certain branches. These have 4 ft. wheels and 14 in. by 20 in. cylinders, and are very similar in appearance to the standard shunting engines except that they were

* The 2-4-2 tank engines of the 1090 class had no radial axleboxes.

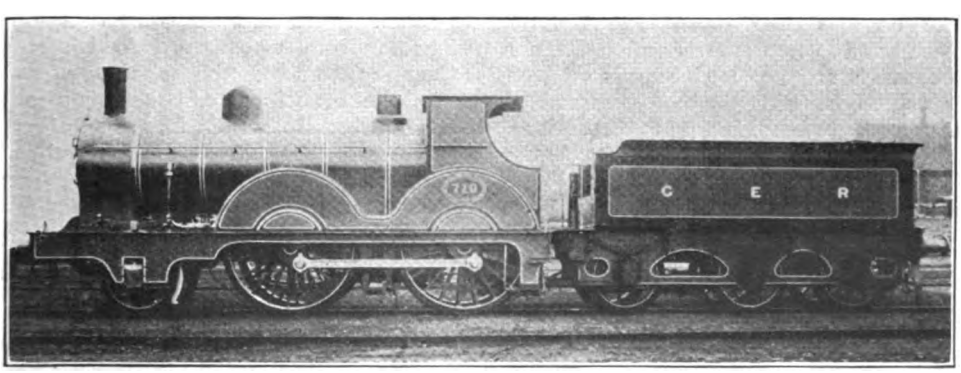
Digitized by Google

painted the blue colour used for the passenger engines. These twenty engines may be regarded as the Great Eastern "Terriers."

In the next design of express engine the 4-4-0 wheel arrangement used in the last Worsdell engines was abandoned, and the simpler 2-4-0 arrangement took its place. A Roman gentleman—now deceased—who effused Latin poetry, largely, it would appear, for the benefit of the public schoolboy, made the sapient remark, "Quot homines tot sententiae," which, being broadly interpreted, means "So many locomotive engineers, so many opinions." And if this author had not actually got "bogies" in his mind, his expression applies with peculiar force to the condition of locomotive designs during a considerable period of Great Eastern history. Mr. Johnson introduced the leading bogie for passenger engines on to the line in 1873, and nearly all the new passenger and mixed traffic locomotives built by his successors until the early part of 1882 were supplied with them, so that by that year there were 64 leading bogie engines in service. Mr. Worsdell's 562 class, as we have seen, were of the 2-4-0 pattern, but with radial leading axleboxes, but he turned out the eleven succeeding compounds with bogies, so that by the end of 1885 there were 75 bogie engines in service. Then came a severe "slump." Not only were all the engines constructed during the next 12 years without bogies, but nearly all the older bogie engines were broken up, so that by the end of 1897 there were only 12 in service. Then just as the bogie, as far as the Great Eastern was concerned, appeared doomed to follow the dodo into extinction, some new express engines to be mentioned later came into being. By the end of 1900 the number of bogie engines had risen to 32, and since then a very large number have been built, so that there is to-day hardly a single express engine on the line not provided with bogies. For many years there were certain of our leading railways that seemed as if they would not touch bogies at any price, whilst others built no express engines without them. However, they have all capitulated one by one, the Great Eastern included, the London and North Western being about the last to enter the fold. This railway, however, sneaked in by a back gate by building hybrid bogie engines, and then calling the arrangement a "double radial truck." I am not quite sure whether there are—officially speaking—any bogie engines on the London and North Western even yet.*

Nevertheless, the new Great Eastern engines of 1886 to 1897, albeit without bogies, were excellent machines. The 710 class, as they have frequently been called, had 7-ft. coupled wheels, 18 in. by 24 in. cylinders, and 1,230½ sq. ft. of heating surface. The majority had 140-lb. pressure, but the last ten, built in

* This depends largely upon the true definition of the word "bogie." If a bogie is simply a four-wheeled truck, then the London and North Western has a very large number of them, but if the definition includes that the truck must turn about a vertical bogie pin, then the railway in question has no bogie engines.



Photo] [*Locomotive Publishing Co., Ltd.*

MR. J. HOLDEN'S FIRST 2-4-0 EXPRESS ENGINE, NO. 710.

Built at Stratford Works, 1886. Wheels, 7 ft.; cylinders, 18 in. by 24 in.

Digitized by Google

1897, Nos. 1030 to 1039, had the pressure increased to 160 lb. In the form of the framing a return was made to that of Mr. Johnson's No. 1 class, with outside bearings for the leading wheels only. This style of frame, so much used in the latter part of the nineteenth century on the Midland, Great Western, and North Eastern Railways, may perhaps be termed the "Leeds" or "Yorkshire" framing, as it derived its origin from the engines of the "'forties" constructed by Messrs. E. B. Wilson and Co. and Kitson and Co., though in all probability it was first applied by Mr. John Gray, then Locomotive Engineer of the Hull and Selby Railway.

The 710 class, in the order of their construction from 1886 to 1897, were Nos. 710 to 769, 700 to 709, 781 to 790 (these ten were subsequently renumbered 770 to 779), and 1010 to 1039. They became the standard Great Eastern express engines, and were naturally to be found all over the system. The earliest of the class were at Stratford, Cambridge, Norwich, Yarmouth, and Ipswich. There were such a large number (110) of them, and their various stations were at times changed about so considerably, that it would take up too much space to describe their movements in detail. Suffice it to say, that there was no important locomotive station on the Great Eastern without a considerable number of these engines. The last ten with the increased pressure of 160 lb. were distributed as follows:—1030 to 1033 at Stratford, 1034 and 1035 at Ipswich, and 1036 to 1039 at Norwich. These engines had tenders with water scoops, and when the London-Cromer expresses were first inaugurated on July 1st, 1897, with the non-stop run of 131 miles between Liverpool Street and North Walsham, engine 1037 was the engine selected to "open the ball." The Cromer expresses had, however, been started in the previous year 1896, but without the long run mentioned, and were then worked by engines 762 to 764 stationed at Ipswich and 765 to 767 stationed at Norwich. These engines were specially fitted with oil-burning fittings, and water scoops to the tenders, for the purpose of running these trains.

One of the class, No. 724, merits special mention, in that it went to Yarmouth when almost new, in 1888, and remained there for about 22 years, during which time it was always in the charge of the same driver, Collins. This must be almost a record for one engine and man to be together on main line express work.

The performances of the 710 class were generally of good, but not brilliant, quality. They usually kept very good time without having to run at exceptional speeds. Moreover, signal slacks occurred very frequently. The following is an average run in 1895 with the 1.20 p.m. express from Liverpool Street and 155 tons. Engine 718:—

Miles.	Chains.			Time-table.	Actual.
		Liverpool Street...	dep.	1.20	1.20.0
4	3	Stratford	pass	1.29	1.28.10
9	77	Chadwell Heath...	„	1.37	1.35.35
20	14	Shenfield	„	1.50	1.49.25
29	60	Chelmsford	„	2.0	1.59.15
38	48	Witham	„	2.12	2.10.5
51	55	Colchester	„	2.28	2.25.25
59	36	Manningtree ...	„	2.39	2.36.40
68	56	Ipswich	„	2.52	2.49.35

Time was gained to the extent of 2½ min. The running average throughout was actually 46.1 m.p.h., but if reckoned between Stratford and Ipswich, the speed was 47¾ m.p.h.

With engine 734 and 180 tons, in 1889, 1½ min. were gained on a 43-min. schedule from Chelmsford to Liverpool Street (29¾ miles), the maximum speed down the Brentford bank being 67 miles per hour. But the majority of the expresses of those days were allowed such a margin of time, that anything beyond the ordinary in the matter of speed was very unusual—in fact, unnecessary.

(*To be continued.*)

Digitized by Google

The Literature of the Iron Road.

RARE AND CURIOUS RAILWAY BOOKS.

By BASIL MERCER.

OF all the hobbies that are within the reach of ordinary mortals, it may be said that book-collecting is the most satisfying to the soul, for it is the hinge on which nearly every other collective pursuit turns. To enjoy any collection in the proper manner one should be versed in the literature of the subject, be it old china, gardening, chemistry, or a model railway, but you will get satisfaction out of books without further diversions; they are the alpha and the omega. I do not say that practical knowledge of a subject is to be "shunted" in favour of book-knowledge, for the obvious reason that all extremes are bad. I do say, most emphatically, that a man who has a sound book knowledge of his particular study will seldom be found altogether wanting when he comes to practical matters.

In approximate figures there are 1,500,000 books in the British Museum Library, and over 2,000,000 in the Bibliothèque Nationale at Paris. Two thousand books of assorted sizes occupy a fairly considerable space in an ordinary room; he who is wise will specialise. It is more or less impossible to have a complete library, but it is possible to get together a thoroughly representative collection of books on a special subject; to this may be added works of general literature, which, however, are in a different category from the "collection." The latter are there for reading purposes only; they have no special attraction apart from their literary merit. The collection comes under another heading; some of the books may not be read at all; they will merely be referred to, or glanced at, from time to time. Their chief joy to the collector is that of possession, to which may be added the fact that they elucidate many details in connection with his particular bent.

To the student of railway matters books on the subject are at once a joy and a despair. The very vastness of the field of search appals him. He does not know where to begin; he cannot decide straightaway on any particular course of action. The demand for books about railways being relatively small, the collector meets, first of all, the fact that such books are frequently only issued in small numbers. A history of the Caledonian Railway, for example, does not sell so well as Mr. Kipling's "Jungle Book," or Mr. Stevenson's "Treasure Island"; the appeal is to a somewhat limited section of the community, so the publisher takes measures accordingly. Many railway books of quite indifferent merit have a greatly enhanced value by reason of their being scarce; the difficulty of getting hold of books such as these is increased still more when the desired volume happens to be the only work on that subject.

There is also the difficulty of getting to know of the books that one wants. A few publishing firms make a speciality of technical books, mainly on locomotives and engineering works; by glancing through several catalogues it is relatively easy to see what has been done in this direction. Works of this kind are generally highly technical in language, and, therefore, more interesting to the engineer than to the student of general railway matters. Railway literature in its true sense is written by all sorts of authors, and published by any number of different houses; it comes into being in the oddest way, with the natural consequence that books are at times rather scrappily compiled. One dare not ignore even the most rubbishy work, as it may contain some item of information, or some good illustrations, that are not to be found elsewhere.

It may not be a bad idea to review, briefly, some of the more important works; books that have left their mark on

Digitized by Google

subsequent volumes of later date. All who are interested in railways owe a deep debt of gratitude to the late Frederick Williams for his two works, *Our Iron Roads* and *The Midland Railway*. Taking the latter first—it preceded its companion by some years—we find a comprehensive and correct narrative; the tale of this great undertaking is pleasantly told, and no point of importance is omitted, a detail to which more recent historians of the railway might with profit devote considerably more attention. Mr. Williams' other book is one that I should like to see every boy who shows keenness on this matter read before proceeding with anything else; it is not too long; it is chatty; and it is a veritable mine of information. Naturally, it does not contain everything that is to be said on the subject, but it does hold a great variety of history, and deals with every aspect of the railway service; it has the invaluable faculty of leading the reader on, and inducing him to go further into some point than is possible with the limited capacity of one fair-sized volume.

There is a non-scientific, but extremely agreeable work in two volumes, Pendleton's *Our Railways;* this book, though not at all technical, is by no means without value; much of the historical matter that it contains is found nowhere else, and the illustrations are equally original. A very useful feature is a chronological table, with illustrations, of the greater railway accidents of the British Isles. Among efforts of this type may be mentioned W. J. Grinling's *Ways of Our Railways* and Prothero's *Railways of the World;* they have the same limitations as Mr. Pendleton's work, but a great deal can be learnt from them, and they make very pleasant reading. A somewhat more elderly book that would be included in this description is Roney's *Rambles on Railways,* published in 1868; it contains much information and many original remarks, but it suffers from the drawback of bad arrangement; the author seems to have determined to act up to his title, for he is rather inclined to ramble through his subject. Still, his wanderings are not at all dull, and his remarks are valuable if only for the reason that he deals with a period of railway development that has not received a great deal of attention. He makes an interesting comment on the grievances of canal owners who said that they were ruined by the railways and, with singular lack of self-perception, posed as philanthropists: "In process of time, the canal owners and lessees managed to more than double the charge for the conveyance of cotton between Liverpool and Manchester, and also to more than double the time for its delivery. They did more; if any of their customers happened to displease or offend them, their goods were put under ban. Canal managers were the trade unionists of those days." A curious point about the book is its rather French style of "make-up"; title-page and type distinctly resemble the ways of our friends across the Channel.

John Francis' *History of the English Railway, 1820-1845,* is a book that no railwayist ought to be without. Published in 1851, it deals with the interesting period of the famous Railway Mania of 1845; the observant may have noticed that the forty-fifth year of the century has almost always been one that has left its mark on the history of England; one may even trace a certain resemblance between the Young Pretender and George Hudson, the "Railway King," for both had careers of meteoric suddenness. Notwithstanding the fact that he deals with rather a prosaic subject, Mr. Francis writes with an old-world courtesy and a restraint that is all too uncommon in these days; it seems to suggest how Lord Chesterfield would have written about Sir Roger de Coverly. He tells us of the early troubles of the Eastern Counties Company:—"A peculiar fortune, or misfortune, seemed to follow the Eastern Counties Railway. Although a line of much importance, it carried no weight in the money market. Although its engineers calculated on no great difficulty, they found their calculations erring. Although the directors judged the land would present no obstacle to its owners, they found themselves hampered with an engagement to one of the lords of the soil, which they could with difficulty pay."

Two other books, though of an earlier time, possess great charm for anyone who likes good style, Roscoe's *Grand Junction* and *London and Birmingham* guides, which are, perhaps, the most beautiful books ever produced on a railway subject. In addition to their literary

Digitized by Google

interest (they exhibit a considerable knowledge of topography and a fund of anecdote), they possess as illustrations a marvellous series of steel engravings, and each book has a most admirable map; they are elegantly bound in half-morocco, and their type, paper, and broad margins lend an air of refinement, while adding greatly to the comfort of the reader. Our modern guides present a sorry contrast with these sumptuous volumes; one cannot imagine a beautifully-phrased sentence like the following in a book of to-day :—" There is a natural order in the progress of general discovery which bears a striking analogy to the process of individual thought and mental existence." In some ways our civilisation shows sign of retrogression rather than progress; we have increased the comfort of railway travel, but we do not describe it so nicely. Need I add that Mr. Roscoe nowadays is rather rare? You will not come across him on every bookstall.

Of course, it must not be supposed that all guides of these early days were as beautiful as the book I have just described. Many of them were small, unpretentious handbooks, designed more with a view to use than elegance. Withal, there are some very nice little tomes amongst them; they are fairly easy to collect, as, for some occult reason, quite a considerable number of these booklets appear to have survived the ravages of time and the book-hater. Guides to the London and Birmingham and other early lines by Messrs. Wyld, Osborne and Freeling may be found without much trouble; they should all three be cherished, as they differ in their narration of details. The firm of Osborne issues a time-table in Birmingham to this very day, an interesting feature of which is the plan of New Street Station at the beginning; perhaps this is the effect of tradition. One of the most fascinating of these tiny guides is Groombridge's *Handbook for Travellers along the London and Birmingham Railway;* in it are given the fare and time-tables (December, 1839), a map of the line, and " twenty-five fine engravings on wood "; these last are a source of delight to the historical enthusiast. The phraseology is quaint in the extreme :— " On arriving at a very elegant skew bridge, which carries the road from Watford to St. Albans over the railway, and at about seventeen miles and a half from London, we enter the WATFORD STATION, where every arrangement is made for the comfort and convenience of passengers. The first and second class waiting-rooms are very commodious, and so is the departure yard, which is sheltered from rain by an elegant corrugated iron roof." Another book, the name of which I have forgotten, chronicles the fact that " females " are in attendance for the comfort of lady travellers.

While on the subject of early railroadiana, we must not pass over Bradshaw; although we know that it is only a natural effect, it is very puzzling when one picks up a Bradshaw of the " 'forties." The microscopic dimensions of the famous time-table in those days gives the surprised collector a sort of shock, when he recalls the bulk of the present-day tables. So much did this affect me that, on one occasion, I very nearly missed securing a bundle of six Bradshaws, circa 1843-1847, which were offered for the reasonable figure of half-a-crown for the whole lot. I did not realise what I had missed until after I returned home; then the horrible consciousness of what I had done dawned upon me. I hurried off early next morning, and, mercifully, found them still for sale. Another nice little work is Bradshaw's Companion, a tiny book measuring about 4 in. by 2 in.; it includes a fair amount of information and some coloured maps and town plans. As is the way with first editions, a first issue of Bradshaw obtains a fairly stiff price, £34 15s. being paid for one at an auction just before the war. There are some advantages in being a millionaire!

The five volumes of Smiles' *Lives of the Engineers* may be picked up quite easily, new or second-hand. The author is a trifle verbose, and too much inclined to platitude, but he contrives to scatter a good deal of important history through his pages. Like Bunyan's *Pilgrim's Progress,* it is a book that one has to read, because so many people refer to it; it is not without interest, though far too full of praise. As an antidote to this enthusiasm, we may read *Who Invented the Locomotive Engine?* by Oswald Dodd Hedley, if one is lucky enough to secure a copy of this very scarce pamphlet. The

Digitized by Google

general trend of this brochure may be seen by the subjoined extract :—"Mr. Smiles in his book attributes to the late Mr. Stephenson perfection, or something nearly approaching to it; but of this I do not complain. He might have made it appear, if he could have reconciled it with facts, that the subject of his memoir was the inventor of the centre of gravity, or of the planetary system; but when he assigns to him the invention of locomotion, it is imperative on the ingenious biographer to base his assertion on something more tangible than appears throughout the 546 pages of this life of George Stephenson. The *invention*, I believe, I have clearly shown was Mr. Hedley's, who conducted it to a successful issue at Wylam, under difficulties which few men but himself could have surmounted. I claim for his memory a simple act of justice. The contemporaries of a man are not always willing to accord it, nor indeed his immediate generation, but the time assuredly arrives when his merits are discerned and appreciated, and that meed of praise to which he was entitled liberally and cheerfully awarded." As a nation, we are a little too much inclined to hero-worship. George Stephenson has been worshipped so blindly for a considerable time that it may not be altogether bad to take a corrective; Hedley's book is excellent for this purpose.

The observations of some of the early fathers who set down for us the history of railway affairs in days that are now almost out of recollection makes one doubt their veracity without denying the unconscious humour of some of their paragraphs. In 1854 the Rev. W. E. Dickson, M.A., backed by the Society for Promoting Christian Knowledge, issued an instructive work called *Railways and Locomotion*, from which the following excerpt has been culled :—"On a dark night, and in a lonely part of the line of the London and North Western Railway, a goods engine, yoked to a train of 88 loaded wagons, had come to a stand in consequence of the breakage of one of these coupling-rods. On hearing the distant whistling, we roused the village blacksmith and his mate, and hastened to the spot, where the driver and fireman were already engaged in removing the couplings, an operation which gave us all full occupation for at least an hour." It must have been a merry scene; I do not know if the good vicar's "we" included all the inmates of the vicarage, or whether it is merely the editorial pronoun. One conjures up a mental picture of the blacksmith and the cook, helped by the former's assistant and the vicar, hammering at the machine on one side, while the train staff did the same work on the other side, both groups being surrounded by a chorus of villagers, ploughmen, etc. It is more than satisfactory to learn that the efforts of this heterogeneous mob were crowned with complete success, for, after the broken rod had been removed, we are told that "the noble machine drew off its 88 wagons with apparent ease, and without any sign of slipping!" The shareholders of the period ought certainly to have passed a most grateful vote of thanks to those responsible for the efficiency of the locomotive department. The wagon of those days was much lighter than the present vehicle, but, to make up for this, the engine was very much less powerful; even allowing for 3 tons per loaded truck it was an heroic performance for an early "single," especially the start without slipping; it is rather a pity that this very efficient type of engine has not been perpetuated.

No collector should fail to acquire, when opportunity offers, the works of Lecount, Ritchie, and the learned Dr. Dionysius Lardner. In the same category may be placed the rather technical treatise of the Comte de Pambour, which, though mainly of interest to the engineer pure and simple, is sufficiently rare to merit attention on that ground alone. Zerah Colburn's works ought to find a place on the shelves of any well-regulated library, for, although they cater principally for the taste of the engineer, the delicately executed plates are a joy for all time; nor are the learned American's views on European railways altogether without interest. These are fine library works, planned on a grand scale, and measuring 15 in. by 10 in.; a great deal of general railway lore is set forth in nice clear type, and there are some admirable tables included. Mr. Colburn's somewhat monumental effort was published at New York in 1858.

One of the most important books published in the first part of the nineteenth century is *The Railways of Great Britain*

Digitized by Google

and Ireland, by John Whishaw, Civil Engineer. The second and enlarged edition, published by John Weale in 1842, is the better, as this issue contains much valuable additional matter. It is a portly volume, about 9 in. by 11 in., with 500 pages of reading and 20 plates, the latter being very beautifully engraved. The book is fairly entitled to be called a "work." In the letterpress it gives a good account of all railways open at the period, with many observations on the permanent way, rolling stock, financial situation, and line of business of each particular company. The plates include a goodly selection of locomotive types in use at that time, drawings of passenger carriages and goods wagons, a map of the British Isles, gradient profiles, summit levels, and a diagram in colours showing the highest and lowest prices of various railway shares; several of these diagrams are executed in colours, and all are works of art. Another book of the early period is Brees' *Glossary of Technical Terms.* This book, published in 1839, gives, in addition to the foregoing matter, a copious extract of the evidence given before Parliament on the London and Birmingham and Great Western Railway Bills. This report is full of historical interest, for it contains the evidence of such people as the two Stephensons, Joseph Locke, Brunel, Rastrick, our friend, Dr. Lardner, and Charles Vignoles.

Stokers and Pokers is a lively account of life on the London and North Western Railway in 1849; as well as these chatty remarks there is included in the book the official Rules and Regulations of the Company, the publication of which was strongly discountenanced in after years. There are a few lines describing the departure of a train which are singularly reminiscent of Frith's famous picture, *The Railway Station,* which, however, depicted the platform at Paddington :— "It is impossible, however, to help reflecting what a variety of emotions must every day be excited within the train as well as on the platform at Euston Station by the scream or departing whistle which we have just described. From the murderer flying from the terrors of justice down to the poor broken-hearted creditor absconding from his misfortunes; from our careworn Prime Minister down to the most indolent member of either House of Parliament—each simultaneously escaping after a long protracted session; from people of all classes going from or to laborious occupation down to the schoolboy reluctantly returning to, or joyfully leaving, his school; from our Governor-General proceeding to embark for India down to the poor emigrant about to sail from the same port to Australia—the railway whistle, however unheeded by the multitude, must oftentimes have excited a variety of feelings which it would be utterly impossible to describe." These words were called from the author after he had witnessed a young man faint upon hearing the engine whistle; it would take more than a locomotive whistle to cause our modern young men to swoon off, hardened as they are by motor horns and explosions of all kinds. But it must have been a very restful age to live in. For some unknown reason, this work is almost always bound up with *The Libyan Desert;* a railway is not a desert, Libyan or otherwise, but it was still something of a novelty : *ex Africa semper aliquid novi.*

Books of personal reminiscences, diaries and the like, are seldom without interest, especially when the writer has held some important appointment which has brought him or her into contact with all kinds of humanity. Mr. G. R. Neele, who preceded Sir Robert Turnbull in the important office of Superintendent of the Line, reminisces charmingly about his eventful career on the North Western. It is a book of no set plan, save that the events are in some kind of chronological order, but this does not detract from its usefulness; it is an almost complete history of the company and its ways and works during the time of the author's service. Mr. Neele has much to say about the adoption of the absolute block and the continuous brake, for both these indispensable accompaniments of the modern railway came into full use during his term of office. A paragraph from the book will best convey an idea of its style and the author's observations on men and matters :—" 1876. To celebrate the completion of the Model Rule Book the members of the Committee were invited by Mr. Needham, the Chairman, to make a special trip from Settle to Carlisle, on the Midland line, then about to be opened. A

Digitized by Google

Pullman car train was provided, with luncheon, and we had the pleasure of viewing the striking scenery of the new route. Ingleborough and Penyghent were pointed out to us, and we saw more of Blea Moor and Dent Head than was intended through some want of preparation for our train." This may strike the reader as rather harsh, but Midland traffic working was a little sketchy in those days! Mr. Neele is also an authority upon the travels of the Royal Family, and often travelled with the late Queen Victoria. Of these journeys he gives a faithful and at times amusing account; he appears to have had an eye for humorous detail. "At Carlisle the complaint from the ladies broke out again—one of them complaining of a 'deadly smell' in the vehicle. Dr. Reid left our friendly little supper table in the refreshment-room and undertook to act as Inspector of Nuisances." Sir Daniel Gooch, the famous broad gauge champion, has also left a diary, full of information that is seldom found elsewhere, about the Great Western Railway and the *Great Eastern* (steamship). He gives us some original reflections upon our patent law:—"I look upon the patent law as a great curse to this country. It cannot be worked with perfect honesty. Patents are taken out for all kinds of absurd things, and by people with little or no practical knowledge of the work they undertake, and the really practical man in carrying out his work is met at all points by the claims of some patentee. I have in my practice constantly found the disadvantage of the law; not that I object to reward a man for a real invention; but the real inventors are rare, while the patents are counted by thousands." And there is a sentence that might have come from the pen of Samuel Pepys; Gooch is describing the opening of the railway to Exeter, May 1st, 1844:—"It was a very hard day's work . . . . my only chance of sitting down was for the hour we were at dinner. Next day my back ached so much I could hardly walk. Mr. Brunel wrote me a very handsome letter, thanking me for what I had done, and all were very much pleased."

Coming to something a little more modern, two books of the 'eighties demand our regard. The first, *English Express Trains*, by E. Foxwell, dates from 1884. As time-tables of this period are extremely scarce, the information contained in this book is most valuable; it sheds a flood of light on an epoch of railway history when little is known about train services; at least, little that is reliable. It is breezily written, as the excerpts will show:—"The Great Northern is a comparatively small line, and not only heads the list for speed, but, in proportion to its length and the population served, provides many more expresses than any other company. The rest of the world outside England cannot show so much high speed." Of the Midland he says:—"The Midland stops wherever it can absorb passengers, and works very hard the whole way, taking gradients as part of the day's programme." The North Western comment is characteristic:—"This is the old established railway firm, and does a larger business than either of its more energetic rivals." The later book, *Express Trains, English and Foreign*, is the joint production of Foxwell and Mr. T. C. Farrar. The date of this is 1889; it gives many useful details of train services, forming a convenient record of the times; the foreign matter included is of special value, showing, as it does, that in those days things were in every sense more peaceful on the Continent than is the case to-day—trains were extremely leisurely in their careers. Like Mr. Foxwell's previous effort, this book has a breezy style. The Cambrian is commented upon thus:—"Both North Western, however, and Great Western appear to pose as rival vultures over an expiring prey; but the Cambrian has of late discovered signs of new vigour." This remark is a curious case of a prophecy coming true, as the Cambrian of late years has undergone a complete metamorphosis. Two excellent maps, with the main lines distinguished by different colours, are given with this book, and add greatly to its usefulness.

In 1893 a remarkably handsome and useful book was put upon the market; this was *British Railways*, by J. Pearson Pattinson, who says in his preface that it is curious that "in a country which was the birthplace of railways, and which has seen a most active and enterprising development of this means of internal communication, so few standard works on

Digitized by Google

the subject have made their appearance." Mr. Pattinson endeavours to remedy this defect, and has produced a compact and complete work, which, though not exhaustive, contrives to tell us something of importance about all the principal lines. His information is accurate and admirably set out, and the book is embellished with some well-executed line drawings of locomotives and a number of clearly-drawn gradient profiles of the chief main lines. Another book that deals with our railways in general is Mr. W. M. Acworth's *Railways of England,* an exceedingly readable work, which, in addition to giving us an independent survey of railway history and policy, contrives to shed much illumination on a number of technical points; in particular, I should like to draw attention to the time-table diagram of the service between Liverpool and Manchester over the metals of the North Western Company. This book, which is profusely illustrated, was first published in 1889; since that year it has run through at least five editions, and has been carefully revised and brought up to date by the author. Mr. Acworth also produced in 1890 his book, *The Railways of Scotland.* It is interesting from the literary point of view, though a less ambitious work than that which deals with the English lines; a map is given, but there are no illustrations or diagrams.

The two last-mentioned works bring us down to modern times, and many new books on railways have been published. The Midland rejoices in a second history, done by the late Clement E. Stretton, of Leicester, who tells us many new things about the subject, thus connecting Mr. Williams with the present day. Mr. Grinling's *History of the Great Northern Railway* is an adornment to any collection; the story is admirably told, and the book is a striking example of what a railway history can be at its best. There are also histories of the Lancashire and Yorkshire (a quaint book by Thomas Normington), the London and North Western, the North Eastern, and the Great Western. Lord Monkswell's books on English and French railways should not be missed, especially the latter; the different conditions are well set forth, without the comparison seeming odious. Among smaller works, *The Whitby and Pickering Railway,* by Mr. G. W. J. Potter, will delight the heart of the railway archæologist; the author goes deeply into the story of this little line, which now forms part of the North Eastern, and includes a large number of extremely interesting illustrations. General railway matters, especially where statistical tables are involved, are dealt with in the numerous books of Mr. Pratt, who is most useful to any one dabbling in controversy, while the books and pamphlets by Mr. W. J. Scott, B.A., have earned the unstinted appreciation of ardent railwayists.

This is a very wide subject, this matter of literature dealing with railways; being limited by space, I have not been able to do more than touch the fringe of this absorbing subject; to treat the matter adequately would require a large volume. As it is, there are many omissions which I deeply regret. For example, I have not said anything about the publications of the railway companies. The Great Central Company's book, *Per Rail,* and the West Highland (now N.B.R.) guide, *Mountain, Moor, and Loch,* are excellent examples of what can be done this way. The various booklets issued by the companies ought not to be despised by the collector of literature on railways; many of them are very beautiful productions, well written and charmingly illustrated; sometimes one may come across quite unique information in them, and some of them are, quite unconsciously, very amusing. It is, as I said above, a branch of the subject that is by no means to be neglected. Readers of the RAILWAY MAGAZINE may be interested to know that, many years ago, there existed another publication that had the same title; it was conducted by John Herepath, and was first published by Wyld and Son in 1836. It is a clever and entertaining work, containing much information and some unique illustrations. I do not recommend my readers to build hopes on finding a copy, for it is extremely rare; they will have to be content with the gifts the gods send them, and read the RAILWAY MAGAZINE of to-day. They might do worse.

Digitized by Google

New 4-6-0 Type Locomotive, Highland Railway.

IN the British Isles the first system to employ the 4-6-0 wheel arrangement for locomotives was the Highland Railway. Some goods engines of this type were introduced in 1894 by Mr. David Jones, and more recently, the late Mr. Peter Drummond introduced some 4-6-0 type passenger locomotives known as the "Castle" type.

Now a new series having this wheel arrangement has been supplied by R. and W. Hawthorn, Leslie and Co., of Newcastle-on-Tyne, and the RAILWAY MAGAZINE is indebted to Mr. C. Cumming, Locomotive Superintendent of the Highland Railway, for the illustration and particulars of one of the engines.

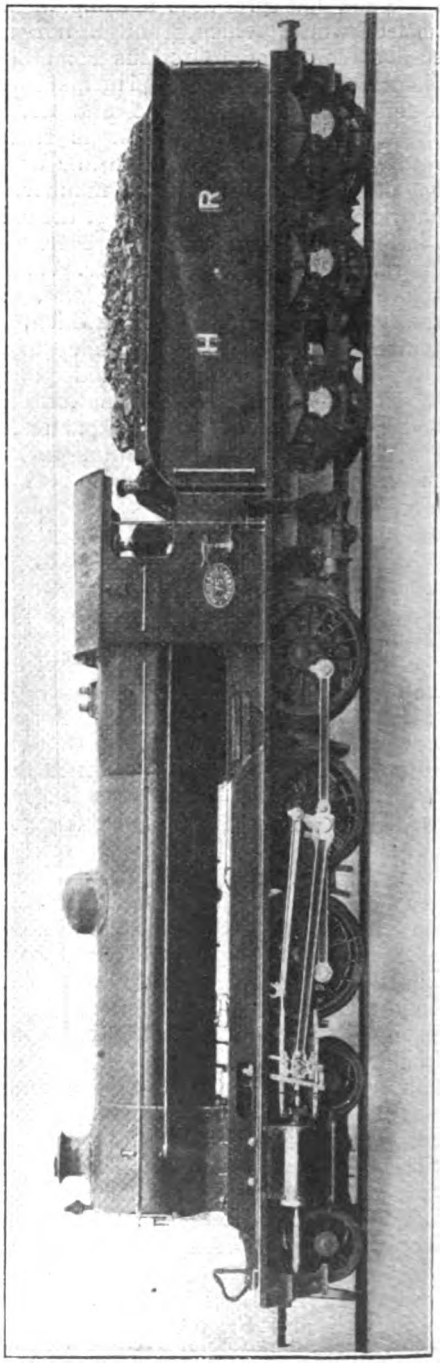
It will be seen that the design is of a thoroughly modern character. The engines are intended principally for working heavy goods trains between Inverness and Perth. They have outside cylinders driving the middle pair of coupled wheels, and steam distribution is effected by means of inside admission piston valves above the cylinders, worked by Walschaerts valve motion outside the frame.

Of large proportions, the boiler is set well up above the frames. It is equipped with Robinson's superheating apparatus, and has the "Belpaire" type of firebox. Safety valves of the "Ross" type are located above the firebox. The commodious cab has ample roofing extending back to cover the front portion of the tender.

The engine is fitted with the Wakefield mechanical lubricator to valves, pistons, &c., and to all wheel bearings of the engine except those of the bogie.

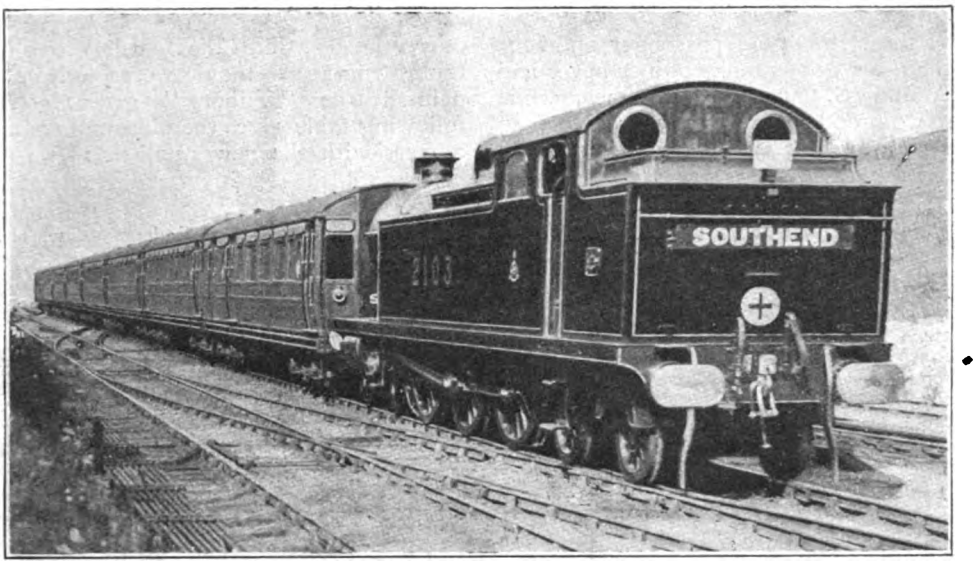
Leading particulars are :—

Cylinders, diameter	20½ in.
Piston stroke	26 in.
Coupled wheels, diameter ...	5 ft. 3 in.
Bogie wheels, diameter	3 ft.
Wheelbase, rigid	12 ft. 6 in.
Wheelbase, engine and tender...	46 ft. 6 in.
Length of engine and tender over buffers	55 ft. 5 in.
Boiler pressure	160 lb. per sq. in.
Heating surface tubes	680.8 sq. ft.
„ superheater smoke tubes	387.95 „
„ firebox	130.25 „
Total	1,199.0 sq. ft.



The tender has a water capacity of 3,000 gals., and a coal capacity of 5 tons. Weight of the engine and tender in working order is 92 tons 2 cwt.

Digitized by Google



Photo] [*F. E. Mackay.*

4-6-4 SUPERHEATER TANK ENGINE, NO. 2103.
This locomotive is hauling an Ealing-Southend corridor train. These trains are worked by two electric locomotives between Ealing and Barking.

The Midland (L., T. and S. Section) of To-Day.

By J. F. GAIRNS.

AMONG smaller yet by no means insignificant railways, once independent, but now merged into one or other of the "great" systems, the London, Tilbury and Southend always attracted a considerable degree of attention, and although the war period has prevented the realisation of the somewhat elaborate scheme for widenings and electrification for which the Midland Railway Company had obtained Parliamentary powers, so that, except in certain respects, the "Tilbury" section is still operated largely as a distinct division of the parent line, and the years which have elapsed since absorption in 1912 have not witnessed the drastic changes which otherwise would probably have been effected by this time, the section has retained many of its old-time characteristics. It is thought, however, that although no essential changes have to be recorded, yet a few remarks on the general results of "Midlandisation" will be appreciated by many readers.

All the locomotives have been painted in standard Midland colours, red for passenger engines, black for goods. Incidentally, all have been renumbered with the characteristic Midland numerals on the tank sides, names, of course, disappearing entirely. Including engines under order at the time of absorption, the locomotive stock consisted of 94 engines, made up as follows :—

36	4-4-2	tank engines,	6 ft. 0 in.	coupled	wheels,	now Nos.	2110-2145
34	4-4-2	"	6 ft. 6 in.	"	"	"	2146-2179
14	0-6-2	"	5 ft. 3 in.	"	"	"	2180-2193
8	4-6-4	"	6 ft. 3 in.	"		"	2100-2107
2	0-6-0	tender engines,	5 ft. 0 in.	"	"	"	2208-2209

Digitized by Google

Of these, the 4-6-4 passenger and four of the 0-6-2 goods tank engines never had L.T. and S. numbers or names, while the two goods tender engines, Nos. 49 and 50, were always known by numbers only, though, like the earlier 10 0-6-2 tank engines, they were originally painted the "Tilbury" green. The following table gives the old numbers and names, with the new numbers :—

M.R. No.	L.T.S.R. No.	L.T.S.R. Name.	Date built.	Builder.	Type.	Cylinders.	Coupled wheels.
2100	—	Not numbered or named in L.T.S.R. series.	1912	Beyer, Peacock and Co., Ltd.	4-6-4T.	20in. × 26in.	6ft. 3in.
2101	—						
2102	—						
2103	—						
2104	—						
2105	—						
2106	—						
2107	—						
2108	—	Numbers blank at present.	—	—	—	—	—
2109	—						
2110	1	*Southend*	1880	Sharp, Stewart and Co.	4-4-2T.	17in. × 26in.	6ft. 0in.
2111	2	*Gravesend*					
2112	3	*Tilbury* (*a*)					
2113	4	*Bromley*					
2114	5	*Plaistow*					
2115	6	*Upton Park*					
2116	7	*Barking* (*a*)					
2117	8	*Rainham*					
2118	9	*Purfleet*					
2119	10	*Grays*					
2120	11	*Stanford*					
2121	12	*Pitsea*					
2122	13	*Benfleet*	1881	Sharp, Stewart and Co.	4-4-2T.	17in × 26in.	6ft. 0in.
2123	14	*Leigh*					
2124	15	*East Ham*					
2125	16	*Low Street*					
2126	17	*Thames Haven*					
2127	18	*Shoeburyness*					
2128	19	*Dagenham*	1884	Sharp, Stewart and Co.	4-4-2T.	17in. × 26in.	6ft. 0in.
2129	20	*Hornchurch*					
2130	21	*Upminster*					
2131	22	*East Horndon*					
2132	23	*Laindon* (*b*)					
2133	24	*Ockendon*					
2134	25	*Stifford*					
2135	26	*West Thurrock*					
2136	27	*Whitechapel*					
2137	28	*Romford*					
2138	29	*Stepney* (*b*)					
2139	30	*Fenchurch*					
2140	31	*St. Pancras*	1892	Nasmyth, Wilson and Co.	4-4-2T.	17in. × 26in.	6ft. 0in.
2141	32	*Leyton*					
2142	33	*Wanstead*					
2143	34	*Tottenham*					
2144	35	*West Ham*					
2145	36	*Walthamstow*					
2146	37	*Woodgrange* (*c*)	1897	Sharp, Stewart and Co.	4-4-2T.	18in. × 26in.	6ft. 6in.
2147	38	*Westcliff* (*c*)					
2148	39	*Forest Gate* (*c*)					
2149	40	*Black Horse Road* (*b*					
2150	41	*Leytonstone*					
2151	42	*Commercial Road*					
2152	43	*Great Ilford* (*c*)					
2153	44	*Prittlewell*					
2154	45	*Burdett Road*	1898	Dübs and Co.			
2155	46	*Southchurch*					
2156	47	*Stratford* (*c*)					
2157	48	*Little Ilford*					

All rebuilt at Plaistow with 19in. × 26in. cylinders, large boilers, curved roof cabs, &c.

Digitized by Google

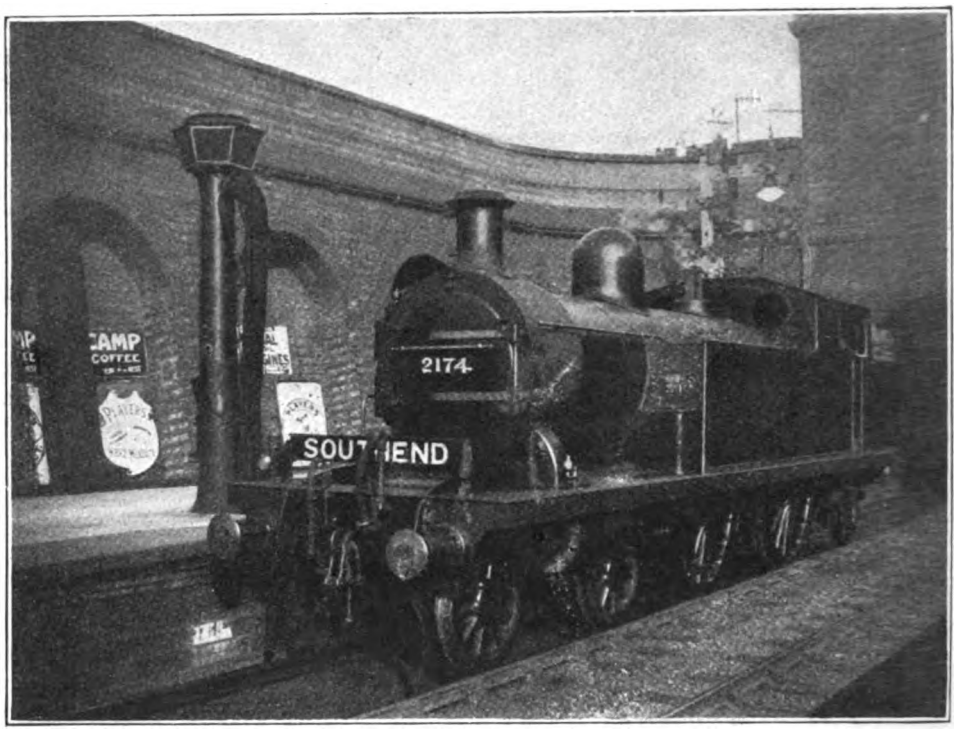
M.R. No.	L.T.S.R. No.	L.T.S.R. Name.	Date built.	Builder.	Type.	Cylinders.	Coupled wheels.
2158	51	*Tilbury Docks*	1900	Sharp, Stewart and Co.	4-4-2T.	18in. × 26in.	6ft. 6in.
2159	52	*Wennington*					
2160	53	*Stepney Green*					
2161	54	*Mile End*					
2162	55	*Wellington Road* (*d*)					
2163	56	*Harringay*					
2164	57	*Crouch Hill*					
2165	58	*Hornsey Road*					
2166	59	*Holloway*					
2167	60	*Highgate Road*					
2168	61	*Kentish Town* (*f*)					
2169	62	*Camden Road*					
2170	63	*Mansion House*	1903	N.B Loco. Co.	4-4-2T.	18in. × 26in.	6ft. 6in.
2171	64	*Charing Cross*					
2172	65	*Victoria*					
2173	66	*Earl's Court*					
2174	67	*Westminster*					
2175	68	*Mark Lane*					
2176	79	*Rippleside*	1909	R. Stephenson and Co.	4-4-2T.	19in. × 26in.	6ft. 6in.
2177	80	*Thundersley* (*e*) (*g*)					
2178	81	*Aveley*					
2179	82	*Crowstone*					
2180	69	*Corringham*	1903	N.B. Loco. Co.	0-6-2T.	18in. × 26in.	5ft. 3in.(*j*)
2181	70	*Basildon*					
2182	71	*Wakering*					
2183	72	*Hadleigh*					
2184	73	*Cranham*					
2185	74	*Orsett*					
2186	75	*Canvey Island*	1908	N.B. Loco. Co.	0-6-2T.	18in. × 26in.	5ft. 3in.(*j*)
2187	76	*Dunton*					
2188	77	*Fobbing*					
2189	78	*Dagenham Dock*					
2190		Not numbered or named in L. T. & S. series.	1912	N.B. Loco. Co.	0-6-2T.	18in. × 26in.	5ft. 3in.(*j*)
2191							
2192							
2193							
2298	49 (*i*)	Not named.	1899	Sharp, Stewart and Co.	0-6-0 Tender	18in. × 24in.	4ft. 6½in.
2299	50 (*i*)						

(*a*) Rebuilt and fitted with condensing apparatus 1904. Still so fitted, and painted black.
(*b*) Do. do. do. Condensing apparatus now removed, and engines painted usual red. Curved roofed cabs still remain.
(*c*) When first rebuilt painted grey.
(*d*) Renamed *Bow Road*, 1902.
(*e*) Shown at Franco-British Exhibition, 1910, and temporarily named *Southend-on-Sea*.
(*f*) Specially decorated for King Edward VII.'s Coronation.
(*g*) Do. do. King George V.'s Coronation.
(*h*) Do. do. Queen Victoria's Diamond Jubilee.
(*i*) Now fitted with tender cabs, and painted black.
(*j*) All painted black.

It will be noticed that two of the four engines (Nos. 3, 7, 23 and 29) which were fitted with condensing apparatus, rounded cab roofs, Westinghouse water pumps, and painted black, at the time of the opening of the Whitechapel and Bow Railway in 1902 (these worked for a time on Metropolitan District services on their turns), have had the special equipment removed. These two, now Nos. 2132 and 2138, are painted red, but still have the rounded cab roof. The other two, Nos. 2112 and 2116, remain specially fitted, so that they are available to meet any special emergency requiring them to work through the tunnels of the Whitechapel and Bow line, or for maintenance trains when current is off the conductor rails there.

All of the 36 "small" 4-4-2 tank engines—the famous Whitelegg "Universal" machines, which attracted so

Digitized by Google



Photo] [*F. H. Stingemore.*

4-4-2 TANK ENGINE, NO. 2174, AT KENTISH TOWN.

much attention in the '80's, and which performed all duties (express, local, goods, etc.) until 1897—now spend a large portion of their time in goods traffic, though they also work many local passenger trains, especially those of an "extra" character, particularly "workmen's." It is true that most of their goods working is in the nature of distributing runs, to and from Little Ilford sidings, and to and from Commercial Road goods depot, but they frequently work trains of substantial weight, especially on the level route between Little Ilford and Tilbury.

General passenger traffic is worked mainly by the 6 ft. 6 in. 4-4-2 tank engines Nos. 2146-2179. Of these 16 are now of the large-boiler class, 12 as rebuilds, and four built new to the same design Nos. 2146-2157 were the first series of the 6 ft. 6 in. class, but several were rebuilt by the L.T. and S.R. at Plaistow during the years immediately preceding 1911, and the whole of the first 12 were so treated in due course. In 1909 four new engines—Nos. 2176-2179—were built to this design, one of them—No. 80, *Thundersley,* temporarily named *Southend-on-Sea*—being shown at the Franco-British Exhibition of that year.

These 16 engines rank as the "express" locomotives of the line, and most of the numerous fast and heavy expresses between Fenchurch Street and Southend are worked invariably by them. In their old-time "green" livery they were most attractive engines, and the work they did, and still do, full of interest. And in "Midland red" they continue to satisfy æsthetic ideas, though several have reappeared from Derby works at various dates with extended smokeboxes and standard Midland chimneys, the lines of which do not harmonise so well with those of the original design.

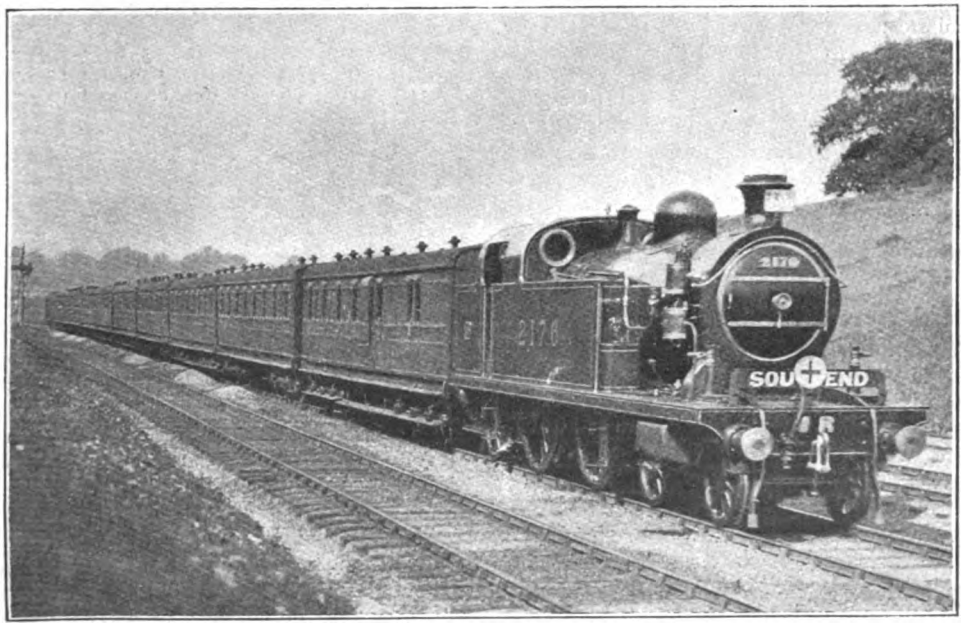
The remaining 18 passenger engines—Nos. 2158-2175—continue as built, and rank secondary to the rebuild class, though they do a great deal of heavy and important work, including a few turns with the bigger series on the Southend services.

Of the goods engines, the two old

Digitized by Google

tender engines—bought to meet an emergency in 1898, and not of "Tilbury" design—are now numbered in the ordinary Midland series, and not in the 2100's as are all the rest. Their work was always of a more or less "odd-and-end" character, and is still of that order. They have tender weather-boards, as so largely used on the main Midland system, and are, of course, painted black. The 0-6-2 goods tanks do most of the really heavy work, and as they run systematically over the Tottenham and Forest Gate and Tottenham and Hampstead Railways to reach the Midland sidings at Brent (Child's Hill), they frequently have their work cut out, for not only are loads heavy, but the gradients are in many places very severe indeed. No other "Tilbury" engines work regularly over that route, except for the secondary 6 ft. 6 in. engines taking Southend-St. Pancras passenger trains, but in compensation Midland 0-6-0 tender engines of all classes work through more or less frequently from the main system to Tilbury Docks and the L.T. and S. section. Occasionally, too, these engines work the St. Pancras-Southend trains, and on special trains Midland 2-4-0 and 4-4-0 (rebuilt) engines can at times be seen.

Besides the regular "Tilbury" engines, a few Midland locomotives are, or have been, systematically employed on the L.T. and S. section. Among these are several 0-6-4 tank engines of the 2000 class, which have appeared from time to time, partly in replacement of L.T. and S. engines at Derby for repair or rebuilding, but also to amplify the stock. On occasions these big engines—never seen in London otherwise—have worked on passenger services, including Southend "semi-fasts," but their main work is on goods traffic. There are also several of the ordinary 0-4-4 Midland tank engines working in the sidings at Plaistow, Little Ilford, Commercial Road, &c. These are principally used as yard shunters, but one was employed for a time working with two Midland bogie coaches as an "auto-train" on the Grays-Upminster-Romford services. An old Midland 2-4-0 tender engine, No. 137, on ballast trains, and the occasional appearance of a bogie single engine with the inspection saloon, complete the record of "Midlandisation" as regards general



Photo] [*F. E. Mackay.*

FENCHURCH STREET TO SOUTHEND TRAIN PASSING UPMINSTER.
4-4-2 tank engine, No. 2176.

Digitized by Google

aspects of the locomotive stock. It must be added, however, that although the "Tilbury" 4-6-4 tank engines, Nos. 2100-2107, have never done much work on their own system—for reasons affecting the engineering restrictions operating on the line—they are now performing useful work on Midland coal trains between Wellingborough and Child's Hill.

In regard to rolling stock, except for changes in lettering and numbering, in view of the new ownership, there is not much calling for remark. There are, however, plenty of bogie vehicles (some formed by fitting two bodies, from the four-wheeled coaches provided in 1902 jointly with the Metropolitan District Railway, on one underframe), so that while one can frequently travel in four-wheeled coaches of the 1877-1880 pattern, or in six-wheelers of the following decade, the usual stock for principal trains is bogie, and exclusively so on all the Southend express services.

relatively few decelerations of the fast business trains. Bearing in mind that the standard loading of expresses is 11 bogies—a few consist of eight or nine bogies—and occasionally up to 13; that every seat is almost invariably occupied at business hours, and that slow speed is inevitable, at least between Fenchurch Street and Bromley (3 miles for which 10-12 min. are required in almost every instance), and in large measure also the remaining distance to Barking (7 miles out), an average of 42-45 m.p.h. for the non-stop runs, Fenchurch Street-Westcliff, or Stepney-Leigh, requires very high-class work to be done between Barking and Leigh or Westcliff, notwithstanding the inclusion of fairly long banks of 1 in 110 over the Langdon Hills in both directions, and between Leigh and Southend.

The following table of the principal business expresses includes only those having more or less lengthy non-stop runs, and will be of interest :—

		DOWN.								
	S.	S.	S.	S.			N.S.	N.S.		N.S.
Fenchurch Street ... ... dep.	12.55	1.0	1.5	1.48	2.6	4.7	4.57	5.6	5.16	6.17
Stepney ... ... „	—	—	—	1.54	2.12	4.13	—	—	5.22	6 22
Burdett Road ... ... „	—	—	1.12	1.56	—	—	—	—	—	—
East Ham ... ... „	—	—	—	—	—	S.	—	—	—	—
Barking ... ... „	—	—	—	—	N.S.	—	—	—	—	—¶
Upminster ... ... „	—	—	1.32	2.16	—	—	—	—	—	6.43
Leigh ... ... arr.	—	1 53	2.1	2.45	3.2	4.57	—	5.55	6.7	7.12
Westcliff ... ... „	1.48	1.57	2.5	2.49	3 6	5.1	5.51	5.59	6.11	7.16
Southend ... ... „	1.53	2.2	2.10	2.54	3.11	5.6	5.56	6.4	6.16	7.21

S.—Saturdays only. N.S.—Not Saturdays.

	UP.					
Southend ... ... dep.	—	7.39	8.28	8.36	8.55	9.2
Westcliff ... ... „	7 36	—	8.31	8.39	8.58	9.5
Leigh ... ... „	—	7.45	8.36	8.44	—	9.9
Barking ... ... „	—	8.24	—	—	—	—
Burdett Road ... ... arr.	8.25	—	—	—	—	—
Stepney ... ... „	—	8.38	—	9.32	—	9.58
Fenchurch Street ... ... „	8.33	8.44	9 30	9.39	9.50	10.2

To amplify the Southend bogie sets the Midland Carriage Works at Derby turned out, in 1913, two sets of 13 bogie coaches of the standard Midland pattern, but fitted with Westinghouse brake instead of vacuum, and these are used in the Southend express traffic, while a few odd vehicles of the same design are included in the make-up of other sets otherwise consisting of the usual varnished-teak "Tilbury" bogies.

From the point of view of traffic, the changes are not great, and it is noteworthy that the war has so far produced

It will be borne in mind that these are only those making the best overall times, but there are numerous other trains with only one or two more stops, and calling for equally difficult work on the part of the engines, while at other periods of the day there are a number of good trains, besides the through Southend-St. Pancras trains, and the through Southend-Ealing trains (worked electrically west of Barking, and consisting of special corridor coaches), all of which are more or less fast on the Tilbury main line. The last mentioned are also usually fast be-

Digitized by Google

tween Barking and Whitechapel or Aldgate East (hauled on this stage by District electric locomotives), and sometimes also in the western districts of London. There are also through Hammersmith-Upminster trains (L.T. and S. compartment stock), which are more or less fast on the electric section.

During recent years there has been a steady development of residential traffic in districts between Barking and Benfleet, and to foster this a number of fast trains make stops at stations such as Hornchurch, Upminster, East Horndon, and Laindon, usually distributed over various trains, so that they can all make good time for Southend and Westcliff traffic, which is still the mainstay of the section on the passenger side.

On the other hand, the older Tilbury route has developed very much industrially, the little village station of Purfleet, for example, being now quite a busy one because of the various works and factories which have been erected during recent years in view of the convenient riverside and railside location there and elsewhere along the route. Consequently, there are not so many fast trains for Grays and Tilbury, except for certain special ones, such as the 5.25 p.m. down, which is booked to Grays (20 miles) in 36 min., with stops at Stepney and East Ham. This route is, in fact, exceedingly busy on the goods side, and bids fair to become even more so.

Most of the London district suburban and workmen's traffic to and from stations Bromley to Barking inclusive, is now, as it was becoming before 1911, dealt with by District and Midland electric stock working over the Whitechapel and Bow line. It is, as it was in the steam days, very heavy, and at busy periods there is now a constant succession of electric trains, many passing some of the intermediate stations. The trains terminate eastwards at either East Ham or Barking, the former using the extensive sidings at Little Ilford for terminal purposes, and westwards work through to Wimbledon, Ealing, Richmond, and even Hounslow and South Harrow. Some of these are made up to 8 or 10 coaches on the Tilbury section, dividing, if need be, at Whitechapel going west.

Like the other railways, the L.T. and S. section has contributed its share of men to meet war demands, but allowing for the disappearance of the big holiday traffic to and from Southend, and the coastal steamer traffic *viâ* Tilbury, it is dealing with a certainly augmented volume of traffic, and yet has curtailed its residential facilities to a very limited extent.

It remains to be seen what the L.T. and S. section will be like when the contemplated widenings of the Great Eastern Railway between Stepney and Gas Factory Junction are completed, and electrification of the whole system realised; but meanwhile it continues to be one of the most interesting of smaller lines.

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

Digitized by Google

An Electric Shunting Locomotive.

TO Mr. George Hughes, Chief Mechanical Engineer of the Lancashire and Yorkshire Railway, the RAILWAY MAGAZINE is indebted for a photograph and particulars of an electric locomotive which has been designed and constructed at the company's works at Horwich, for shunting service at Clifton power station.

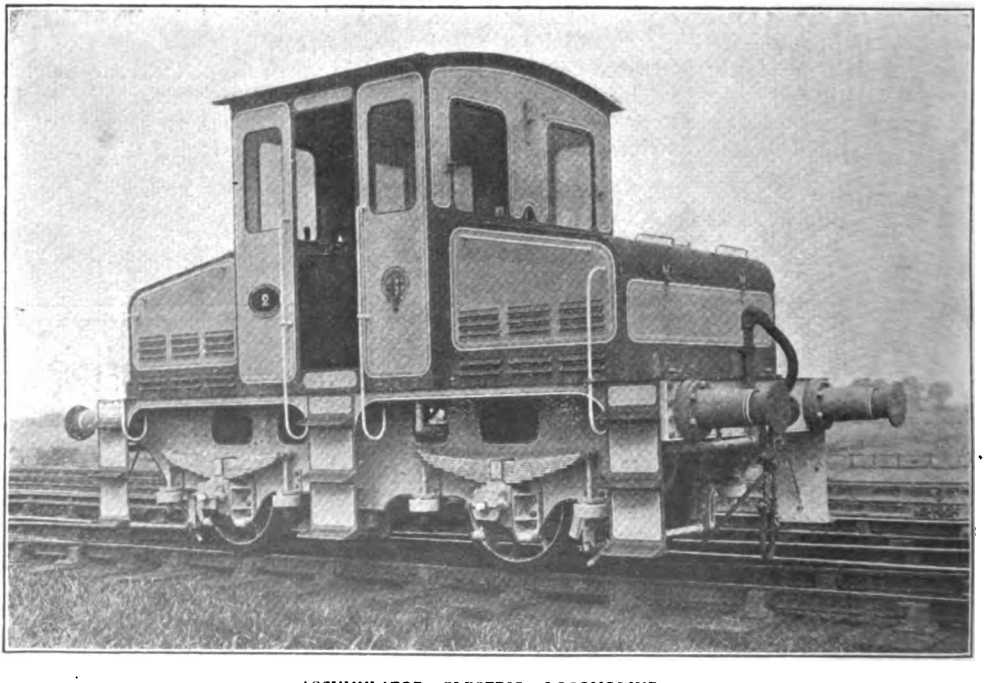
This locomotive is of the accumulator type with batteries divided into two parts, so that the two portions can be used in parallel, to give a voltage of 120, or when working in series, 240 volts. The control system provides series parallel control on motors at 120 volts or 240 volts. There are 10 notches on the controller for both voltages. The 120-volt supply is used for shunting purposes, giving a speed of about 4.5 m.p.h. The 240-volt supply is for running from place to place, the free running speed being 20 m.p.h. on the level. The tractive force exerted at the rim of the wheel up to 2.3 m.p.h. is 5,400 lb., and at the hourly rating 2,500 lb. at 4 m.p.h.

The locomotive was designed to handle three loaded 20-ton coal wagons (90 tons) on an incline of 1 in 189. It was built in place of providing five electric capstans at Clifton power station, and is able to deal with twice the load at twice the speed as compared with capstans, and this at a lower capital and operating cost.

The capacity of the battery will admit of 3.2 hours' continual shunting, or a four hours' continuous run "light" on the level at an average speed of 20 m.p.h. During the dinner hour a boosting charge will give back to the battery 40 per cent. of its total charge, raising the shunting capacity to 4½ hours.

Leading particulars are as follows :—

Length over buffers ...	21 ft. 11 in.
Wheelbase	9 ft.
Wheel diameter	3 ft.
Weight in running order.	17 tons 18 cwt.
Number of motors	2 B.T.H. 18 h.-p. each at hourly rating.
Gear ratio	4.6 – 1.
Batteries	120 cells, I.M.V. 6 type "Ironclad - Exide," capacity 71 kw. hours at 4½ hours rate. Weight of battery—5,040 lb.



ACCUMULATOR ELECTRIC LOCOMOTIVE.
Lancashire and Yorkshire Railway.

Digitized by Google

Some Points Connected with Locomotive Design.

FOR the benefit of RAILWAY MAGAZINE readers who are studying locomotive design, the following data has been compiled :—

BOILER PRESSURE.—The tendency is to reduce this when adopting superheating. An average figure is 170 lb. per sq. in., with a minimum of about 160 lb.

SUPERHEATING.—750 deg. F. may be regarded as the maximum, and it is not often reached in ordinary working as yet. About 650 deg. F. at the firebox end may be considered normal. Superheating is best on long runs without stops, as the temperature of the steam is more likely to remain normal under such conditions.

TAPER BOILERS.—The weight is reduced at the front, end, and as the heating surface is less effective here than nearer the firebox, whatever loss there may be in steam and water space does not count so much. The idea is to have the largest cross-sectional area where the heat is greatest.

The wide firebox, as on the Great Northern, affords a much larger grate area. This is very helpful, especially when climbing long and continuous grades when steam has to be made rapidly. The Belpaire type of box has the advantage of being directly stayed, and it is, perhaps, possible to get a larger firebox capacity than when the firebox takes the same contour as the boiler.

HEATING SURFACE.—In calculating this the area of the tubes is worked out, and also that of the firebox plates, and, as a rule, the superheating surface is worked out independently. In a British locomotive the tubular heating surface of a 4-4-0 type or any engine having the boiler of the usual proportions fitted with that type of engine will have anything from about 1,100 to 1,600 sq. ft. As an example, the "Director" class of the Great Central Railway has 1,502 sq. ft. in the tubes and 210 sq. ft. in the superheater. A round figure for the firebox is about 160 sq. ft., with a grate area of from 26-30 sq. ft.

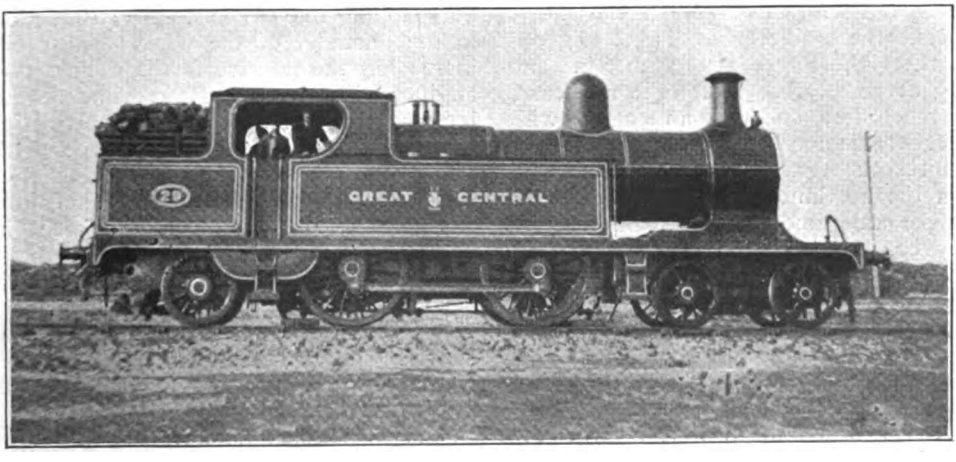
TRACTIVE FORCE OF CYLINDERS.—This can be ascertained by means of a simple formula where the dimensions of the engine are known. Thus :—

$$T = \frac{d^2 \times S \times p \times .8}{D}$$

where d diameter of cylinders,
S piston stroke,
p boiler pressure,
D diameter of driving wheels.

This should be multiplied by 2 for four-cylinder engines.

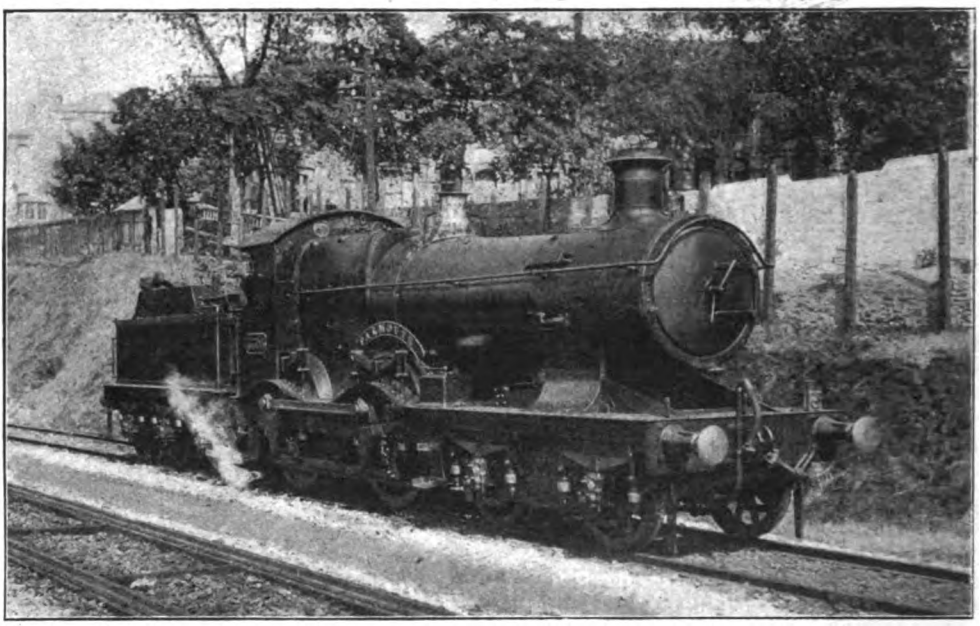
The figure .8 at the end of the formula represents 80 per cent. of the boiler pressure, this being the figure usually taken as a fair average for calculating the tractive force. There is a drop in pressure between the boiler and the cylinders, and



Photo] [*Lt. Phillips.*

GREAT CENTRAL RAILWAY.
4-4-2 tank locomotive, No. 29.

Digitized by Google



Photo] [*Frank Roberts.*

GREAT WESTERN RAILWAY.

Bulldog class 4-4-0 locomotive, No. 3308, *Falmouth*.

if the actual pressure of the boiler were taken, viz., 100 per cent., it would give an entirely erroneous result. Tractive force declines as the speed rises of any engine. At 10 miles per hour the drawbar pull may equal 17,136 lb., for example, but at 50 miles per hour it will have dropped to 224. These are figures from the actual test of an 0-8-0 engine on the Great Northern Railway with small wheels, but with an engine having large wheels the difference is less apparent, viz., 8,400 at 10 m.p.h. and 3,763 at 50 m.p.h. It falls in any case, but much less so with an engine with larger wheels and lower piston speed.

ADHESION WEIGHT.—For British railways the maximum may be taken as 20 tons per axle, and this is reached only in a few cases.

PISTON VALVES.—These, as compared with flat slide valves, are almost frictionless, and require as a consequence much less energy to move them.

VALVE GEARING.—For outside cylinders Walschaerts' gear is popular in most cases for the reason that it is easily accessible, and owing to the combination of movements it is well adapted for carrying outside wheels. Moreover, it effects an accurate distribution of steam. It is not favoured for inside cylinders, as eccentrics must then be used, and accordingly it is cheaper and more simple to use the Stephenson link motion.

WHEEL ARRANGEMENTS.—The heavier the work the more necessity for adding to the number of coupled wheels so as to get greater adhesion weight and make possible the use of larger cylinders without slipping the wheels. Any reduction in the diameter of the wheels assists in increasing the tractive force. Thus, two engines with the same sized cylinders and boilers, as, for instance, 20 in. by 26 in. cylinders, but one a 4-4-0 type with 6 ft. 9 in. coupled wheels, and the other a 0-6-0, with 5 ft. wheels, would differ considerably in the tractive force in favour of the six-coupled engine.

WEIGHT OF LOCOMOTIVES.—The weight of locomotives varies, of course, considerably with the type and size. The heaviest engine running in Great Britain is the Great Western Railway No. 111, *The Great Bear*, 4-6-2 wheel arrangement and eight-wheeled tender. This weighs 142 tons 15 cwt. A large 4-4-0 type, with tender, may weigh about 108-112 tons, and a large 4-6-0 120-130 tons.

Digitized by Google

Military Trains in India.

IN connection with the military authorities of the Government of India, the Great Indian Peninsula Railway Administration have introduced most carefully planned and complete arrangements for the comfortable travel of troops destined for service in the different Indian garrisons.

To fully explain the position regarding these trains, it is necessary to refer to the general arrangements which have from time to time been made for military traffic in India. In "pre-mutiny" days, certain rivers and canals were the only means of transport, but with the advent of railways, these were utilised, and troops were conveyed to their different cantonments "by rail," as this means of communication became established. In such a large country as India, the journeys must be long even "by rail," and to convey European troops through a country wherein the customs and habits of the inhabitants are so different, is no easy undertaking. The Government, therefore, instituted rest camps or large plain barracks at convenient intervals along the main lines of railway, to which the troops were conveyed *in relays;* that is to say, they would undertake their journeys in sections, resting one or two nights, as the circumstances might dictate, at the rest camps. As the speed of trains increased and refreshments and food arrangements became more organised, this system of rest camps was more or less abandoned, and the journeys attempted by through "trains," which stopped at suitable stations for long intervals for meals to be served.

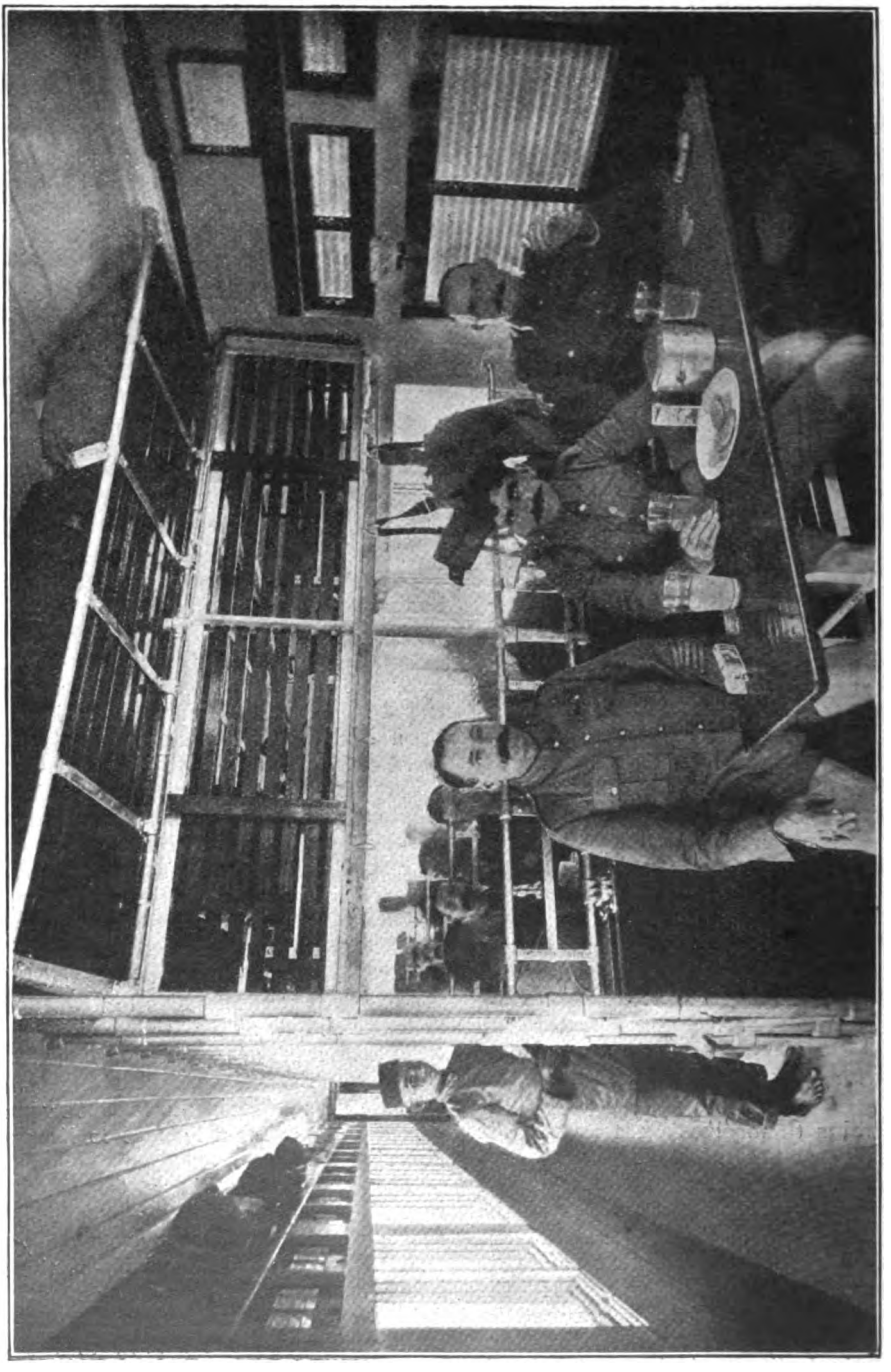
The trains themselves were wanting in convenience and comfort for Europeans, inasmuch as they had to be made up of the standard third-class carriages of the country, which it may here be noted are very different to the third-class carriages used on English railways. If the "class" of carriage could be gauged by the "rate of fare," then the third-class carriages in India would be about eighth class in the British Isles, for the fare charged to an ordinary passenger amounts to the large sum of one-eighth of a penny per mile.

The carriages themselves are plain open vehicles with wood seats of "slat" pattern, and are built to accommodate about 100 third-class passengers. When used for trooping, this number is considerably reduced, usually to two-thirds. It is as well to point out here that in India third-class travel is of a "happy-go-lucky" description, for the passengers appear to prefer having "double" complement in a carriage to half. There then seems to be more voices to carry on the discussions, &c., which appear to go on continuously. The noise in a third-class carriage of an Indian railway train at night is somewhat appalling; it is only on the mail trains, where a slight extra fare is charged for third-class (or on some railways "Inter"), that the native passengers appear to want to sleep.

A soldier bound for India and travelling over the British railways from a country depôt to his port of embarkation is carried in a comfortable and well-upholstered third-class carriage and has little to complain of. On reaching India, however (his arrival was usually timed for the "cold" weather, but recently, owing to war conditions, the journeys have had to be performed in the hot season), he was accommodated in the carriages we have mentioned above. Some years ago, we believe, at the instance of the late Lord Kitchener, the authorities did have "iron rails provided along the inside of the compartments of ordinary 'thirds' on which hammocks could be slung, and so provide more sleeping accommodation for those who previously *had to lie on the floor.*"

The order of things described has recently been considerably changed, and the arrangements now made by the G.I.P.R. leave little to wish for, the men being well provided for in every respect. A kitchen car is attached to each through train and meals are served in the cars during transit—a plentiful supply of ice and filtered drinking water is also available in all the cars throughout the journey.

Digitized by Google



INTERIOR OF INDIAN MILITARY RAILWAY CAR BY DAY.
A meal is being served from the kitchen car.

Digitized by Google

INTERIOR OF INDIAN MILITARY CAR BY NIGHT.
Tired "Tommies" in tiers.

Digitized by Google

Although designed prior to the outbreak of the war, the new trains put into service for the conveyance of troops coming and going to and from the different Indian cantonments, may justly be included in any description of military arrangements now prevailing. The vehicles, which are very original in arrangement and comprise a number of novelties in railway carriage construction, have been designed by the Carriage and Wagon Superintendent, Mr. A. M. Bell, M.I.M.E., and built at the railway shops, and have been reported on as the most comfortable and best arranged vehicles for troop service yet designed.

The cars in which the soldiers are accommodated are each 68 ft. long and 10 ft. wide, all vestibuled together so that a passage exists throughout the train. Each carriage is fitted up with folding berths arranged in tiers, after the manner of a troopship, and provides comfortable sleeping bunks for 66 men; in the hot weather only 44 are usually carried, the upper berths being left vacant. Each vehicle has racks for the kit and accoutrements, and two convenient wash basins, and lavatories are provided—nearly 2 tons of water is carried under each car—this is necessary on account of the difficulty of getting water on some sections. The trains when made up as shown in the drawing carry rations for the entire journey, and the only stops made are for locomotive purposes. The officers are accommodated in a corridor first and second-class sleeping car connected to a compo-" sleeper " and restaurant, whilst the stores, mineral waters, ice, &c., are carried in the end vans. The crew or staff attending the wants of the soldiers are also accommodated in these.

A train made up in this manner is 725 ft. long, and weighs approximately 400 tons. The running time allowed averages 30 miles per hour.

The cars are built very similar to " Pullmans," inasmuch as the body and underframing are closely incorporated, the former being built as a member of the latter. This construction enables the maximum capacity of the loading gauge to be utilised to afford comfortable and roomy interiors. The whole body of the car is of insulating material, " Uacolite," introduced between the two " skins." Ventilation is secured with a double row of exhausting ventilators along the roof, whilst electric fans are provided, one to each cubicle or compartment.

At meal times portable tables are placed between each set of seats, and the meals are served from the kitchen by orderlies appointed for the work.

For night travel the backs of the seats fold " up " to form a second berth, whilst a third falls down from above.

The kitchen car is of similar over-all dimensions to the others, and has a commodious central kitchen with tiled sides and floors and a large cooking range placed central. The range is operated with oil burnt in vaporising burners at each end of its casing. All the usual arrangements of a kitchen are incorporated in this apartment. Adjacent to it is a cold storage for meat, &c., and next to that a compartment or " bar " from which iced drinks, tea, coffee, &c., can be purveyed. At the opposite end of the car there are quarters for the sergeant-in-charge, cooks, attendants, &c. A plentiful supply of water is carried in tanks underneath, whilst electric ventilators are provided in the roof operated from the lighting system of the car. All baggage is carried in the rear brake van, and the train crew, cooks, &c., find accommodation in the front vehicle.

Digitized by Google

The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Before asking for information concerning railway history and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," the twenty-first annual edition of which is on sale, price 5s. net, by post 5s. 6d. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

A Metropolitan Railway Tunnel.

No use is now made of the tunnel just west of Liverpool Street Station (Met.) which carries a double line into Liverpool Street Station (Great Eastern). The Metropolitan Railway was extended from Moorgate Street to Bishopsgate (now Liverpool Street), July 12th, 1875, and Metropolitan Railway trains ran through the tunnel in question to the then new Great Eastern terminus, which was opened for local trains February 2nd, 1874, and for all traffic on November 1st, 1875. The service through the tunnel was only continued for a few months, the Metropolitan Railway being extended from Bishopsgate (now Liverpool Street) to Aldgate, November 18th, 1876.

[Reply to FRANCIS J. GALER.]

The Ideal Gauge.

It would appear, from the adoption of a gauge closely approaching the standard British figure of 4 ft. 8½ in. by practically all main lines in America and on the Continent of Europe, that this is regarded generally as the "ideal" width between rails for all general purposes. As regards loading gauge, however, it is safe to say that the largest practicable loading gauge is the most ideal. British railway companies are considerably hampered in rolling stock development by the lack of sufficient width and height in loading and construction gauges, as compared with the standards obtaining abroad and in America.

[Reply to G. S. and W. R.]

Eskdale Railway.

There are now five locomotives working on above railway: two miniature express engines (*Sanspareil*, 4-4-2, and *Colossus*, 4-6-2), and three side tank engines (*Katie*, 0-4-0; *Ella*, 0-6-0; and *Muriel*, 0-8-0). Of the latter, *Ella* and *Muriel* were purchased from Sir Arthur Heywood's Duffield Bank Railway, and *Katie* from the Duke of Westminster's Eaton Hall Railway, but all three were designed on the same general lines, and built by Sir Arthur Heywood at his Duffield shops. We know of no book dealing with these miniature railways, but they have been made the subject of many articles in different journals.

[Reply to R. M. R.]

Underground Railways' Rail-Gap Indicators.

The current rail on the London Underground Railways is fed in sections, each section being controlled from the sub-stations. Between each section is a gap; this is in order that the current may be cut off at a section of the line only. The indicators are placed so that the motormen may know the exact position of the gap, and thus be able to arrange that when stopping their trains the motors are brought to a standstill in such a position that the front shoes are not on one section and the rear shoes on another section. If such were the case, the two sections would be bridged by the motor.

[Reply to "INDICATOR."]

Great Northern Railway Branches in South Yorkshire.

The lines to which you refer have both been planned to tap hitherto undeveloped portions of the South Yorkshire coalfield. One, now completed, runs from a junction north of Bawtry, on the G.N. main line, to Haxey, Lincs., where junction is effected with the G.N. and G.E. Joint Line, and also the L. and Y. and

Digitized by Google

N.E. Axholme Joint Railway. The other line is to run from Bawtry to Tickhill, on the South Yorkshire Joint Line, but has not yet been commenced. Passenger trains do not at present run between Bawtry and Haxey.

[Reply to J. H. SEWELL.]

Penistone Viaduct.

It was the portion of the viaduct nearest Penistone which collapsed (owing to a subsidence of the foundations) in February, 1916, carrying with it a 2-4-2 tank engine of the Lancashire and Yorkshire Company, which was standing on it at the time. The viaduct was reopened in August of the same year, and the through G.C. express service between London and Bradford was then resumed. During these months the local L. and Y. passenger services from Bradford and Huddersfield were worked to a temporary station on the north side of the viaduct.

[Reply to EDWARD RUSSELL.]

Taper Boilers.

Boilers are tapered out towards the firebox in order to increase the steam space adjacent to the firebox, *i.e.*, at the point where the bulk of the steam is generated. It is thus possible to dispense with a dome, thereby reducing the number of openings in the boiler, and to collect the steam for use by means of a perforated pipe. The maximum taper of tapered boilers is generally on top, the underside of the boiler remaining horizontal; in sectional elevation the tapered end of the boiler is, therefore, eccentric to the front end.

[Reply to EDWARD RUSSELL.]

Long Bogie Vehicles.

By increasing the length of a bogie coach the weight of vehicle per passenger conveyed is reduced, seeing that if the same arrangement of wheels be retained, the weight of the bogie wheels and bogie frames remains more or less constant. The length of the vehicles between bogies is, however, limited mainly by the length of track locking and fouling bars standard on the lines of the company concerned, which must obviously not be exceeded by the distance between any two pairs of wheels.

[Reply to G. S. and W. R.]

City and South London Railway.

You are in error in thinking that the tunnels you mention cross. It is only the platforms which are arranged on the opposite sides of the trains. The disused portion of the City and South London Railway is that from a point just north of the Borough Station to the old Monument Station. When the line was extended to the Bank, a new route was taken from the Borough, so that the very steep incline into the old Monument Station, now disused, might be avoided.

[Reply to "TUBER."]

Feed-Pumps.

The 4-4-0 engines of the 415 class on the L. and S.W.R., as well as various subsequent engines of the late Mr. D. Drummond's design on the same railway, were equipped with feed-pumps in addition to injectors (in certain cases with feed-pumps only) in consequence of the feed water-heating arrangement employed by that gentleman, the ordinary type of injector not being capable of lifting hot water into the boiler. This is doubtless the origin of the noise to which you refer.

[Reply to Gunner F. J. GALER.]

London and North-Western Railway Goods Trains at London Bridge.

By special arrangement with the S.E. and C.R., the L. and N.W.R. works its own goods trains from the West London line *viâ* Longhedge Junction, Brixton, Loughborough Junction, Ludgate Hill (where they are reversed), London Bridge and New Cross to Hither Green exchange sidings, although the latter company does not possess running powers over these lines.

[Reply to Gunner F. J. GALER.]

"Claughton" Engines and the Chester-Holyhead Line.

There is no engineering restriction against the "Claughton" class of engine working between Chester and Holyhead, but at the present time they are not running over that section of the line, as they are fully employed on trains between Euston and Carlisle, and the Liverpool district, and there is some difficulty in turning engines of this class at Holyhead.

[Reply to H. A. WHITE.]

Digitized by Google

O-6-4 Superheater Tank Engines, Metropolitan Railway.

There are four of these engines, respectively numbered and named 94, *Lord Aberconway;* 95, *Robert H. Selbie;* 96, *Charles Jones;* and 97, *Brill.* They were built at the Sheffield works of the Yorkshire Engine Co., Ltd., to the designs of Mr. C. Jones, the Locomotive Superintendent of the Metropolitan Railway, and were all placed in service in 1916.

[Reply to J. H. SEWELL.]

The Ilfracombe Railway.

Now amalgamated with the London and South Western Railway, this line was opened for traffic on July 20th, 1874. It was the result of an Act obtained in 1870 to construct a line 14¾ miles in length, and it was leased to the London and South Western Railway. Steep gradients and sharp curves are the outstanding characteristics of the line.

[Reply to "R.S.V.P."]

4-6-0 Engines on the South-Eastern and Chatham Railway.

So far as we are aware, there is nothing to prevent the employment of 4-6-0 engines on this railway, except possibly considerations of maximum permissible weight on underline bridges. As so often explained in these columns, however, the choice of wheel arrangement in design is one resting entirely with the Locomotive Superintendent of the railway concerned.

[Reply to A. C. A.]

Snifting Valves.

The brass mushroom heads on the smokeboxes of G.E.R. superheater engines, behind the chimney, are snifting valves, designed to admit cold air to the superheater tubes, and prevent the latter burning out, when the engine is "coasting," *i.e.*, running with steam shut off.

[Reply to E. S. COOMBS.]

Caledonian Railway Locomotives.

Judging by what you have already noted, it appears probable that names are no longer to be retained by the few Caledonian locomotives—only seven in all—which possess them. We do not undertake to answer queries respecting locomotive numbers.

[Reply to J. M. GIBB.]

Lancashire and Yorkshire Railway Locomotives.

Names are not carried by the engines of this company. As regards your other query, we can only refer you to the Chief Mechanical Engineer of the railway company concerned, who may or may not be disposed to hunt up and give you the information you desire.

[Reply to R. F. LEGGET.]

Connections Between Passenger Coaches

From your description we imagine that you are referring to electric light connections, which are frequently made from coach to coach in electrically lighted "set" trains in order to enable the guard to operate all the train lights from his brake when passing through tunnels, &c.

[Reply to GEORGE ROBINSON.]

A Disused Line.

We presume you refer to the Kensington-Richmond line of the London and South Western Railway, opened January 1st, 1869, but closed since the outbreak of war.

[Reply to Gunner F. J. GALER.]

All-Steel Passenger Coaches.

Generally speaking, an all-steel coach is substantially heavier than a coach with wooden body-framing and a steel underframe, of the same overall dimensions.

[Reply to G. S. and W. R.]

Southwold Railway Locomotives.

Four engines are owned by this company, all tanks, two having the 2-4-0 and of the other two one has the 2-4-2 wheel arrangement and the other 0-6-2.

[Reply to "INTERESTED."]

Locomotive Records.

In this country the L. and N.W.R. owns the largest number of 4-6-0, the G.N.R. of 4-4-2, and the Midland Railway of 4-4-0 tender engines.

[Reply to "INTERESTED."]

Mellis and Eye Railway.

Originally a separate company, this line was amalgamated with the Great Eastern Railway in 1898.

[Reply to F. J. PALMER.]

Digitized by Google

Railway Literature.

SOME REMINISCENCES (1838-1918). By Colonel H. W. Williams, D.L., J.P. [J. A. D. Bridger, Market Jew Street, Penzance. Cloth, 112 pages. 3s. 6d.] Colonel Williams' recollections extend over 80 years, 23 of which were passed in the service of the London and South Western Railway. Commencing as a booking clerk, he eventually became in London the company's City Superintendent, and resigned that position in 1878 to become Assistant General Manager at St. Katharine Docks. As a consequence a considerable portion of Colonel Williams' reminiscences are of a railway character; in fact, most RAILWAY MAGAZINE readers would consider them the outstanding feature of the book.

A Cornishman by birth, the author has something to say concerning the Bodmin and Wadebridge line and also the old West Cornwall Railway. Of the former he tells the story that a lady passenger complained to the guard of the extensive shaking of the carriages, which he admitted. Shortly after there was an improvement, on which she congratulated him. His answer was, "Yes, we are off the line now."

A story of more recent date concerns the Chacewater and Newquay line. A woman asked for a ticket to Mary Tavy, a station on the South Devon line; the next woman, under the impression that was the correct mode, asked for a ticket for Jane Peters.

At the opening of the South Western line to Delabole a woman came to the station-master and requested him to keep a seat for her in the one o'clock train the next day. When she came to the station on the following day she found the train had left five minutes. Speaking sharply to the station-master, she said: "Well, if you are going to be so particular as that, all I can tell you is you won't do much trade down here."

A few further railway reminiscences of Colonel Williams are as follows:—

1856. I was sent for by the South Western Railway Company, and entered Waterloo Station on January 1st, 1856. I went on trial in the booking office for one month, at the expiration of which I was duly appointed on the staff as a booking clerk.

In the old days there were no lunch or lavatory coaches, but there were so-called express trains, for which extra fares were charged; some went 40 miles an hour, a speed considered rather excessive.

There were no Westinghouse brakes, no communication between driver and passengers in case of need; generally, the only signal was on the station platform, with a distant signal, at some distance at each side, and one could see sparks flying caused by the brakes.

Now, the driver is able to run into the various stations at 30 to 40 miles an hour, and with comparative safety, in spite of the largely increased number of trains at the present day.

As to the carriages, those then in use appear to have been copies from the old road coaches, and a carriage of a present express train would make four of them.

Passengers' luggage was carried on the roof, the guards on many trains rode outside in a kind of sentry-box, called by them a "booby hutch."

On some Great Western trains a man rode in a covered box on the engine tender, with his back to the driver, thus having a good view of the train in case of need on its journey.

In those early days third-class passengers were not treated with the attention and comfort that they receive at the present time.

The third-class, or Parliamentary, train at 1d. per mile was generally timed to start from London stations at a most inconvenient hour.

Speaking of my own experience, I have frequently gone to Waterloo Station about 6 a.m. and found the booking office crowded with third-class passengers on bitter cold winter mornings.

There being no Cornwall railway, Cornish passengers, as a rule, had to travel via Bristol, but the third-class train from Paddington did not arrive at Bristol in time to catch the steamer for Cornwall; however, there was a fairly fast train just before from Paddington that took third-class passengers for stations on the Bristol and Exeter Line, so Cornish passengers took third-class tickets for one of their stations and alighted at Bristol.

This being discovered, no third class was issued above Bridgwater, thus making a third to Bridgwater equal to a second to Bristol.

I do not say that the duties of a booking clerk in those days were particularly onerous; there were fewer trains, but the work was very exacting, not only because of the very large amounts taken in a short time, but also on account of the care required not to book a passenger for a non-stopping station, and, moreover, the clerk was held responsible for all errors.

As the season advanced Sunday became the heaviest day, excursion trains being run to Southampton, Portsmouth, Salisbury, and the Isle of Wight, etc., to which places passengers were conveyed in carriages without windows.

On Sunday mornings, after the departure

Digitized by Google

of the excursion trains, some time was spent in counting the cash, then home to breakfast and the needful wash-up.

There was no time for church; and, as at that time trains did not leave the terminus on Sundays during church hours, the spare time was taken up in visiting the tobacco shops for small change, so as to meet the Sunday afternoon pleasure seekers for Kew Gardens, Hampton Court, Windsor, and other favourite resorts.

1856. Shortly after being at Waterloo Station the railway companies decided to register passengers' luggage to the Continent, and as I had, "or was supposed to have had," a smattering of French, I was appointed for that duty.

A few weeks later another change took place. The Staines and Wokingham Line was just completed, and although a separate company, it was to be worked by the South Western Company. The line ran from Staines to Wokingham, thence over the South Eastern Line, and into their Reading Station.

Again I received instructions to proceed to Reading to take charge of the South Western interests, and on my arrival there I was reminded that under the Act of Parliament I had no outdoor powers at the station. From that time I could clearly see there was trouble ahead, and it came.

The Great Western Company did not encourage third-class passengers, and ran only one third-class train.

The second return fare Reading and Paddington was 6s. 8d., but the South Eastern Railway Company ran a fairly fast train to London Bridge Station at 4s. 6d. return, although the distance was 66 miles, against 36 to Paddington. There being no Underground at that time from Paddington to the City passengers reached the City at less cost and nearly as quickly as via Paddington.

1857. Watching this state of things for some time, I decided to put the matter before the general manager at Waterloo Station. I did so, and as a result received instructions to issue similar 4s. 6d. tickets by our first train; consequently, our distance to Waterloo Station being only 44 miles, the journey was covered in less time, and we soon had the bulk of the passengers.

Seeing how matters stood, the South Eastern Company made a further reduction which I followed, till eventually both companies came down to 1s. 3d. single and 2s. return. These fares continued for, I think, some two years. On Sundays we generally had two or three crowded trains.

The result of all this competition caused me extreme inconvenience; I was forbidden to use the office after the departure of our trains.

As I failed to foresee any improvement in my position I asked for a change, which was refused; I then sent in my resignation, and this was also refused.

Eventually the three companies met and decided to revise the fares and to pool the earnings, an arrangement which, I think, is still in force.

1858. There is one important point I must mention. In those days Reading held a very large pleasure and horse fair, and at one of them I had secured a number of horses for conveyance to London, for whose accommodation I had down a good supply of horse-boxes.

Returning one day from the fair, I found the South Eastern stationmaster had taken some of the boxes, and, being naturally annoyed, I have no doubt I made use of very strong language.

After the departure of their train a gentleman (a perfect stranger) came to me and asked me what was the trouble just now between the stationmaster and myself. I replied, "Really, sir, I do not think it has anything to do with you." His answer was, "Perhaps not; only I am the Chairman of the South Western Railway Company." Of course, I at once explained all the case, and I have no hesitation in saying that Mr. Chaplin (of the firm of Chaplin and Horne) never forgot me.

I should have mentioned before that at the time I joined the South Western Company in 1856 the Crimean War was just over. I well remember the great excitement there was at Waterloo Station when peace was declared.

To celebrate it, there was a great naval review at Spithead, when a number of special trains were provided, not only for the Crown Ministers and members of both Houses of Parliament, but also for the general public.

The demand for seats was enormous, and very considerable difficulty was caused in keeping separate trains for each party. I was engaged in the issue of tickets, special police being appointed for the examination of the invitation cards.

In one case the War Minister (Lord Panmure) came without an invitation card, and the police refused to allow him to pass, upon which he said who he was. The policeman at once remarked, "Oh, no, that won't do; we have had him here several times to-day."

I well remember the magnificent illuminations throughout London, and the excitement of the enormous crowds in the streets on the return of the Guards from the Crimea.

About this time I had my first experience of telegraphy, and on being admitted into the telegraph office and shown the instrument at work the clerk asked if I would like to ask a question at any station. I did so of Portsmouth, and was astonished at receiving an answer in one minute.

1858. When residing at Reading there was a deal of correspondence in the papers about tips to railway servants; accordingly, the

Digitized by Google

General Manager of the South Eastern Railway Company issued a circular to his staff to the effect that any servant of the company seen to demand or receive a tip from a passenger was to be instantly dismissed.

One evening I was on the platform just before the departure of a train, when I saw a guard receive sixpence from a lady in a carriage. On turning round the guard at once saw that the stationmaster had also seen it, so he forthwith rushed to the bookstall, bought a newspaper, and took it to the lady, together with the change. I said to the guard, Barrett by name, "That was a narrow shave for you." His answer was, "Well, sir, I do not care what trouble I get into so long as I get out."

I do not think for one moment that railway officers are more intelligent than other people, and I have a recollection of one case to the contrary.

A stationmaster was promoted district superintendent; one of his first acts was to recommend at headquarters that a weighbridge should be provided at one of his stations. He was requested to send particulars as to position, size, etc. After forwarding the necessary details, he was told that the size he suggested was not large enough to take such articles as furniture vans and similar vehicles. He replied that the difficulty could be overcome by weighing the front wheels first and the hind wheels after.

From the foregoing RAILWAY MAGAZINE readers will realise that the book, which makes no claim to literary merit, at least contains much matter of railway interest.

OTHER BOOKS RECEIVED.

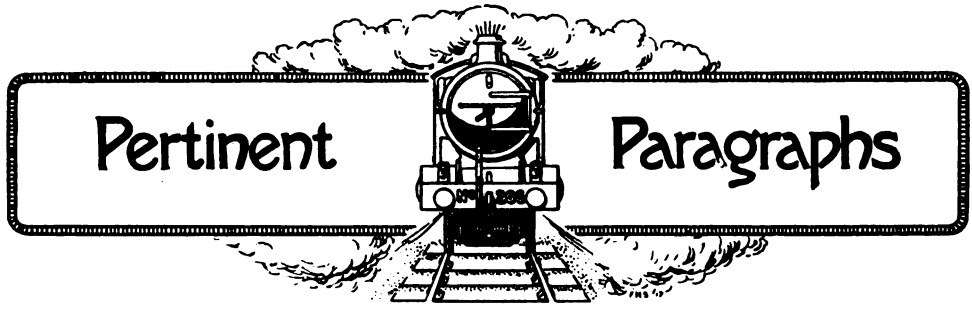
TAINTED GOLD, by Paul Trent; THE TELEPHONE GIRL, by Alice and Claud Askew. [1918. Ward, Lock and Co., Ltd., Salisbury Square, London, E.C.4. Price 5s. each.] In "Tainted Gold" love-making and money matters are "as a mingled yarn." Mr. Paul's moneylender is a gentile, but the villain of the plot is a Jew. The story is well told. Quite out of the common is "The Telephone Girl." Brought up in sordid surroundings, she turns out to be "blue blood" by birth, so that her noble lover does not marry beneath him after all.

Photo] [*F. H. Stingemore.*

MIDLAND RAILWAY.

Rebuilt superheater 4-4-0 engine, No. 483, and rebuilt 4-4-0, No. 411, hauling an up fast good trains.

Digitized by Google



Our Frontispiece.

THE frontispiece to this issue is a reproduction of a fine photograph by Mr. R. J. Purves showing the mid-day North Eastern Railway luncheon car express from Newcastle-on-Tyne to Liverpool. This train, which is for the present suspended, was composed of palatial corridor stock owned by the North Eastern Railway, and left Newcastle at 12.30 p.m., calling at Darlington *en route* to York. Here it was detained for the 10 a.m. East Coast express from Edinburgh, and left after the departure of the latter train at 2.35 p.m., now in charge of the Lancashire and Yorkshire Railway, calling at Castleford, Normanton, Wakefield and Manchester to Liverpool, where it was normally due at 5.10 p.m. Our photograph shows the express passing Low Fell, soon after leaving Newcastle, at a speed of 55 miles per hour. It is hauled by one of the famous Worsdell 4-4-0 locomotives of class R, No. 1147, a sister engine of which—No. 1207—is cited by Mr. Cecil J. Allen in his one-hundredth article as having attained a speed of 80 miles per hour on a level track near York, when working the immediately preceding 12.20 p.m. "flier" from Newcastle to Sheffield.

United States Railroad Administration.

IN the September RAILWAY MAGAZINE certain economies in operating the railroads of the United States were described. The following brings up to date the most important of the alterations in railroad conditions brought about by the transfer to Government control. On March 1st the Railroad Control Bill was passed—this regulates the conditions under which the return of the roads to their owners will take place after the war. Two years after the war ends the railways will be returned to their owners, and the basis of compensation shall be a just return on the average net operaing return for the three-year period ending on June 30th, 1917. Provision has also been made, taking into consideration money spent for improvements between June 30th, 1917, and the date upon which the Government assumed control. Here are the terms of an order issued from the office of the Regional Director for the western district. Discontinue the custom of exploiting train service pleasure resorts and the like and all forms of advertising such as pictures, calendars, war maps, etc. Confine newspaper and other advertising to giving necessary information to the public. Standardise all timetable folders, and limit their distribution to avoid waste. Folders must be purely informative and contain no advertising of luxurious trains, claims of superior service, or extraneous matter of any description.

On May 1st practically all ticket offices in towns outside the area served by the respective companies were closed down. Consolidation on such lines has been accomplished in twenty Eastern cities. In New York alone the number of offices has been reduced from over one hundred to five, where, it is stated, the saving in rental will amount to $856,000 a year. In order to eliminate travelling by circuitous routes a system of basing fares on mileage is being compiled, rather than keeping in effect equivalent rates on the various roads between certain points regardless of the number of miles travelled. However, the mileage basis will not be strictly adhered to, it being the aim solely to do away with the travelling by more or less indirect routes. For instance, between Chicago and Kansas City, where a number of lines have almost the same mileage, the same rates will prevail on these lines, although it is possible that one or two of the more circuitous routes will have to charge more than the direct routes. This will probably result, eliminating them as passenger lines between these points. Just how far this system will be put into effect remains to be seen. Many railroad associations which have been maintained by subscriptions from the railway systems went out of business on April 30th last. The United States Railroad Administration does not forbid the continuance of these organisations, but will not allow the expenses in connection therewith to be charged to the railroads. They can, however, be supported from the money which otherwise would go to the stockholders in accordance with the plan of remuneration adopted when the Government took over the working of the lines. The list of railroad associations disapproved is too long to quote, but the following represent some of those of most interest: Bureau of Railway Economics, Bureau of Railway

Digitized by Google

News and Statistics, American Association of Railway Superintendents, Society of Railway Financial Officers, Association of Railway Telegraph Superintendents.

One express company, to be known probably as the Federal Express Company, was created on May 28th last by agreement between Director-General McAdoo and the Adams, American Wells-Fargo and Southern Express Companies. The business of all the separate express companies will be done by the one private corporation. After July 1st, and as soon as possible, the individual names of the separate companies will be erased from wagons, cars, stations, and other places. The new company will be the express carrying agency of the railroads, but under contract to turn over 50¼ per cent. of its gross revenues to the roads for transportation privileges. Through economies by the common use of wagons, trucks, distributing stations warehouses, cars, and the simplification of accounting, it is hoped to save millions of dollars annually.

The division of capital expenditures have approved the spending of $937,961,318 during the next twelve months, of which $440,071,000 represents additions and betterments. The Railroad Administration eliminated $349,247,000, or nearly one-quarter of the proposals submitted by the companies, it being understood that the decisions may be reconsidered in the light of any growing necessity or need of improvements. The amounts allocated to individual companies range from $118,000,000 for the Pennsylvania lines, and to the Chicago and North Western $11,211,000.

From June 25th, 1918, freight and passenger charges were advanced. For freight, traffic increases, smaller on commodities on which there is a heavy movement, range up to 25 per cent., with minimum charges for handling car-loads and less-than-car-load shipments. The essential features of the passenger fares are as follows: The basic fare for single tickets in day coaches will be 3 cents per mile, and all fares lower than 3 cents will be advanced to that figure. Exceptions are made in sparsely settled territory, where the present fares are somewhat higher than 3 cents per mile. Tourists' and return fares somewhat higher than those at present in effect will be established. Passengers travelling in standard sleeping cars will, in addition to the charge for berths or seats, be required to pay a further passage fare of one-half cent per mile, and for tourist sleeping cars one-quarter cent per mile. Season tickets will be advanced 10 per cent. Officers, enlisted men, and nurses of the United States Army and Navy in uniform, and travelling at their own expense, are permitted to buy tickets at one-third of the regular single fare.

Institution of Locomotive Engineers.

Energy, and plenty of it, appears to be the leading characteristic of those who have charge of the Northern Centre of this institution. No effort is spared to make the centre of real live interest and usefulness.

On Tuesday, September 3rd, about forty members visited the extensive works of the Leeds Forge Co., Ltd., Leeds.

The party was divided into four groups and shown round the works by the officials of the company.

Commencing with the steel works, the visitors saw how the company makes its own steel in a row of Siemens-Martin open-hearth acid furnaces, the molten metal being poured into ladles, which are in turn emptied into moulds to form ingots varying in weight from five to seven tons.

In the laboratory tests, both chemical and mechanical, are made of every charge of steel, and again of every batch of plates, to ensure none but the most suitable materials being used The calorific value of the fuels used is also periodically tested, and other materials are here analysed when required.

The groups passed on to the rolling mill, where the ingots brought from the steel works are heated in gas-fired soaking pits and reduced in the cogging mill to slabs of suitable sizes, which are again re-heated in gas-fired furnaces and rolled down into plates of suitable sizes for their ultimate purpose.

The boiler furnace department was next visited, and furnaces for land and marine boilers were seen in every stage of manufacture.

In the smithy the visitors were shown various forms of forgings, all of which are being manufactured in connection with the prosecution of the war.

The principal department of the works is the rolling stock department, where, in normal times, the company manufactures all-steel carriages and wagons of various types, underframes and bogies, etc., but at the present time, as in other establishments of a similar nature to this, the bulk of the plant is actively engaged in the production of war materials of various kinds.

After having exhausted the works the members of the institution proceeded to the offices, where tea was served, during which Colonel Kitson Clark, the Vice-Chairman of the Northern Centre, presented the apologies of Mr. H. N. Gresley, the Chairman, for his unavoidable absence. He touched upon the interesting things the visitors had been privileged to inspect, and the size and up-to-date equipment of the plant and methods of the company.

Colonel Kitson Clark proposed a vote of thanks to Mr. Lane, Managing Director of the Leeds Forge Company, and the Board of Directors for the facilities which had been

Digitized by Google

accorded to the members that day. This was seconded by Mr. George Hunter.

Mr. Burtt, the General Secretary of the institution, was called upon for a few remarks, and he dealt with the recent progress of the institution, directing attention to the fact that another centre was to be established in Manchester, which he hoped would be as successful as the one so ably carried on in Leeds.

Mr. Kidd, works manager of the Leeds Forge, Company, in responding to the vote of thanks, which had been carried with enthusiasm, expressed the pleasure it had given the Directors and staff to be able to afford the members of the institution facilities for the visit. He regretted that, owing to the shortage of labour caused by the war, the works were not in the tidy state he would have wished them to be, but he asked the members to keep in mind the fact that labour had to be economised to the utmost, and no job was done unless it was absolutely necessary.

Midland Great Western Locomotives and their Work.

FROM Dublin, Mr. H. W. Lea writes :—

With reference to the paragraph in the August RAILWAY MAGAZINE regarding Midland Great Western locomotives, it may interest your readers to know that in addition to the engines mentioned by Mr. J. Macartney Robbins I recently noticed one of the larger 2-4-0 locomotives—*Sprite*, No. 24, fitted with a Schmidt superheater, and in regular work on the slip line, where this class of engine at present does all the passenger work.

Mr. Morton, the Midland Great Western Railway Locomotive Superintendent, to whom I wrote on the subject, has very kindly informed me that *Sprite* retains the flat slide valves, and that further engines of this class will be superheated if the valves give no trouble, while three more of the "Celtic" and three more of the "Connemara" class will be rebuilt with either Robinson or Schmidt superheater as soon as practicable.

In addition, he states that Nos. 143 and 144 0-6-0 goods engines have been superheated, while No. 145 and two others are in hand.

Erin-go-Bragh, the first of the "Connemara" class to be fitted with a superheater (Robinson type), is not mentioned by Mr. Robbins. This engine has a much smaller boiler than the more recent rebuilds of what may now be called the "Kylemore" class.

The Midland Great Western train service on the Galway and slip lines, at all events, has been rather improved than otherwise this summer, as though there are fewer trains the three main line expresses in each direction are much better arranged than formerly, and all run non-stop between Dublin and Mullingar. The Up Limited mail has had its booked time for the 50½ miles increased to 75 min., but in practice appears to improve on this pretty regularly. On a recent run at the end of July by this train I was rather surprised to find *Titanic*, one of the old "Celtics," on, instead of one of the superheaters, but with a load of 16 coaches 4 bogies, and 12 six-wheelers, very crowded, we gained 5 min. on the booked time, running very smartly over the first 30 miles from Mullingar and taking the final 20 miles decidedly easy, being ahead of time.

Brecon and Merthyr Railway Engines.

MR. H. L. HOPWOOD, author of the article in the last August RAILWAY MAGAZINE, writes :—

On page 213, September RAILWAY MAGAZINE, Mr. Hewett refers to Great Western engine 1490 which was taken over by the Brecon and Merthyr Railway, and states he has never seen any published dimensions. Perhaps the following particulars may be of use to him :—

Cylinders	15½ in. × 26 in.
Wheels, bogie	2 ft. 8 in.
„ coupled	4 ft. 7½ in.
Wheelbase, rigid	9 ft. 0 in.
„ total	21 ft. 6 in.
Heating surface—tubes	1,349.92 sq. ft.
„ firebox	82.93 „
„ total	1,432.85 sq. ft.
Grate area	20.87 „
Working pressure	150 lb.
Coal	55 cwt.
Water	1,075 gallons
Weight—bogie	16 tons 4 cwt.
„ driving	17 tons 11 cwt.
„ trailing	17 tons 1 cwt.
Total	50 tons 16 cwt.

It was a curious engine, both as regards appearance and dimensions (note the unusual size of cylinders), and apparently the Brecon and Merthyr Railway did not find it successful. They bought it in 1908, and sold it in March, 1916, to the Cramlington Colliery (Northumberland) for £650.

Mr. Hewett says the cab of 1490 was open at the back. This was the case for some time after the Brecon and Merthyr Railway had the engine, but latterly the cab was closed at the rear.

I saw this engine very frequently on the Brecon and Merthyr Railway, and it retained the Great Western green colour all the time (as do the other ex-Great Western engines, Nos. 32 to 34).

I should have mentioned in the article that Brecon and Merthyr engines are mostly painted a brick red, with black and yellow lining, and a good many have brass dome covers. Recent engines have been painted red-brown. The two saddle tanks, 17 and 18, are black without any lining, as are also some of the No. 1 class saddle tanks. Coach-

Digitized by Google

ing stock is finished in lake colour, with large numerals on the doors, indicating the class. The Brecon and Merthyr Railway still retains the second class, as do most (if not all) of the South Wales local lines.

A Railway Club Development.

NOTWITHSTANDING the absence of so many members on war service, the Railway Club, 92, Victoria Street, S.W., still pursues its valuable career.

Its latest development is the establishment of a "Query Department." This has been arranged in order to promote the exchange of useful information between members.

The following list indicates those members who are willing to answer queries relative to the railways set against their respective names, and the committee will be pleased if other members will consent to volunteer to take up the same position with regard to other lines. It is thus hoped to complete a full list of railways, and further particulars will appear in the Club Bulletin The only condition imposed is that members wishing to make inquiries shall in all cases enclose a stamped and addressed envelope:—

Mr. A. W. Bartlett, Great Western, London and South Western, Somerset and Dorset; Mr. H. L. Hopwood, Great Northern; Mr. G. W. J. Potter, Great Eastern, North Eastern; Mr. M. D. Greville, London, Brighton and South Coast Railway (except locomotive matters); Mr. B. M. Bazley, London and North Western; Mr. J. B. Sherlock, Scottish Railways; Mr. E. J. Miller, London Underground Lines; Mr. G. A. Newman, Midland Railway; Mr. F. H. Smith, L.T. and S. Section of Midland Railway, South Eastern and Chatham Railway; Mr. J. S. Lewis, Irish Railways.

At the general meeting on Tuesday, October 8th, at 7 p.m., Mr. E. C. Kearney will give a lantern lecture on "Tube Railways of the Future." Non-members who desire to be present should apply to the Hon. Secretary, Mr. Edwin J. Miller, enclosing a stamped and addressed envelope for his reply. Commencing November, the monthly general meetings will be held on the first Tuesday each month instead of on the second Tuesday as heretofore.

Fewer Trains.

As this issue of the RAILWAY MAGAZINE is preparing for press the various railway companies in the British Isles are seriously considering and perfecting their schemes for the reduction of fuel consumption rendered imperative by the great shortage of coal. A further cutting down of train services must of necessity arise, while the lighting and heating of railway stations will suffer considerable curtailment.

At August 31st the stocks of coal held by twelve leading British lines amounted to 897,833 tons, sufficient only to carry on the traffic for 4½ weeks. At the corresponding period in 1917 the same companies had rather more than 8½ weeks' supply in hand.

Complicated as the problem is, it will be met and overcome by British railway officers as so many other difficulties have been conquered in the past. Unlike the average permanent officials in Government offices, leading railwaymen such as Sir Herbert Walker, K.C.B., and other members of the Railway Executive Committee are not hidebound by tradition, and they are not afraid of creating precedents. This is the secret of much of their strength and the excellent ability shown in the handling of war traffic, troop trains, and munitions, to say nothing of the ordinary commercial and passenger traffic of the country. Bearing in mind the ever-increasing strain on the railways, and the drain on their coal supplies for Continental use, the nation as a whole has much to place to the credit of the railway service generally and to the Railway Executive Committee in particular.

In any case, we are sure that RAILWAY MAGAZINE readers, who are perhaps more enlightened in these matters than many members of the general public, will be the last to complain at the restricting of further joy-riding and unnecessary travel or the curtailment of waiting-room fires and artificial light that under war conditions must be considered superfluous.

Fuel which in the ordinary way would be at the service of the British railways is wanted for shipment to our Allies in order that Marshal Foch may have the means to drive back the German armies to the Rhine, and this coal will not be begrudged. RAILWAY MAGAZINE readers will likewise join with us in wishing continued success to Sir Guy Calthrop, the capable Coal Controller, in the arduous task he has so nobly undertaken.

Wakefield Mechanical Lubricator and Anti-Carboniser.

WE are given to understand that the well-known Wakefield No. 7 Pattern Mechanical Lubricator is being very largely used in conjunction with the Wakefield Patent Anti-Carboniser. The latter apparatus has been designed with a view to overcoming the difficulties, sometimes met with, by the formation of carbon deposit, usually caused through over-feeding the oil. In actual practice it is claimed that the total elimination of carbon deposit is now definitely obtained, and the oil consumption is reduced to a minimum, *i.e.*, ½ to ¾ pint per 100 miles, the valves and cylinders being perfectly lubricated. We are informed that when the anti-carboniser is used the usual practice is to employ a four-way lubricator, taking one feed to the centre of each steam pipe just above the steam

Digitized by Google

chest, and one feed to the centre of the cylinders.

The same lubricator (without the anti-carboniser) is supplied for axlebox lubrication, and the maximum oil feed per box per 100 miles is 2 oz. The practice of applying forced feed to locomotive axleboxes, both in this country and abroad, is rapidly making headway, with a consequent economy in the oil bill and an entire freedom from hot boxes.

By Air or Rail?

ONE reads, especially in newspapers, how aerial transport, such as passenger and mail, will be developed after war, and how the railway will eventually be superseded; also, how much more rapid it will be, &c.

A careful analysis of the subject will show that, except in special cases, involving crossing large expanses of water and great distances, aerial travel is not likely to supersede the railways.

A RAILWAY MAGAZINE reader of many years' standing, Mr. W. G. Landon, himself a flying man, on this much-discussed subject, writes as follows :—

The first consideration is speed. In aeroplanes, as in any other form of locomotion, the cost of increased speed exceeds out of all proportion the amount of acceleration. To-day aeroplanes are designed with speed as the object in view, and it is not likely that such high speeds would be used for commercial purposes. However, for the sake of argument, let us suppose an average of 90 m.p.h., and a passenger-mail service from London to Glasgow. The distance, 400 miles, would be covered in 4½ hours. But we must not forget that the prospective passenger would first have to travel at least 5 miles to an aerodrome on the outskirts of London. For this he would have to allow 45 min. Similarly, 45 min. would have to be added at the other end. This would bring the time to 6 hours. But this 6 hours would be variable. If a 30-mile wind were blowing behind the machine, the speed would be 120 m.p.h., and the journey time reduced 1 hour, but if this wind were against machine, the speed would be 60 m.p.h., and the time increased 2 hours. On the other hand, if you travel by train, the journey is made in 8 hours, with very little time added at either end because the stations are centrally located.

As to comfort, it is doubtful if that of a first-class carriage could be equalled on an aeroplane. Then, having a meal, such as you do on a train, and thereby save time, would be out of the question on a heavier-than-air machine. Turning now to cost of journey, it is obvious that a passenger could not be conveyed by air at anything approaching the first-class railway fare.

Then the question of aerial post. I presume that something like 1s. would be charged for a letter, which, perhaps, would beat the train by 2 hours, and the time saved by sorting mail *en route*, as they do in postal vans, would be lost. If, however, 1s. is to be spent, why not send a telegram?

It must not be forgotten that in winter there are many days when flying would be impossible. Fog may delay trains, but it prevents flying altogether.

The above statements apply equally well to communication with the Continent, and if the Channel Tunnel is ever built, it makes the case for aerial travel even less favourable.

As to increase of railway speed, any railwayman knows that schedules calling for an average of 60 m.p.h. or more for long distances could easily be adhered to with the present locomotives and 250 to 300 ton trains with a good margin for delays. The only question is whether the public will really require such service, and, if so, it could doubtless be supplied, and an extra fare charged.

Lest these views should seem biased, I would say that I am an enthusiastic pilot, but a still more enthusiastic railwayman, and although I enjoy flying immensely, the same could not be said of everyone, and I cannot see anything which would point to aerial passenger or mail routes becoming numerous or popular.

The Importance of Railways in Modern War.

IN connection with recent phases of the fighting on the Western Front, special interest is attached to an article on Railways and the importance of the part they play in the War, more particularly on the Western Front, which is contributed to the September number of the *Windsor Magazine* by Major C. J. C. Street, with illustrations from official photographs. In the course of his theme Major Street, whose name is familiar to many RAILWAY MAGAZINE readers, says :—

The importance of railways in modern war can hardly be over-estimated. A well-known military critic has recently laid stress upon the strategic results that may follow the loss of parts of the railway system of a theatre of war. "The interruption of traffic on important lines as a result of attack, and the disturbance of traffic in the adjoining country by bombing squadrons, are of the greatest strategic importance. The loss of lines and junctions means far more than the loss of land. It means embarrassment in the provision of the fronts, and delay in bringing troops from one sector to the other. In the defence of modern fronts, the most important thing is to be able to move large bodies of troops rapidly to and fro. Railways are the arteries of the modern strategic body. The living blood that rushes through them enables wounded parts of the front to be restored by counter-offensives. The layman cannot even form an approximate idea

Digitized by Google

of the difficulties caused by the loss of such arteries, or what strategic possibilities are lost with a lost railway. The gain in railways is, therefore, to be regarded as strategically one of the most far-reaching results of an offensive."

In examining the part played by railways in war, the subject may be divided into two heads—their strategic functions and their tactical functions. The former may be defined as including movement of troops, both the supply of reinforcements to the fighting zone, and the concentration of reinforcements at any threatened point, and also the supply of rations, ammunition, and stores of all kinds from the bases to the various rail-heads. The latter may be defined as the distribution of men, rations, ammunition, stores, and guns within the battle zone itself, from rail-head to dump. Consequently, it may be said that the strategic functions are performed mainly by the permanent railway systems of the belligerent nations, the tactical functions mainly by military lines built by the armies in the battle zone to meet the requirements of the situation.

The Channel Ferry.

THAT a Channel Ferry service is now in operation between England and France is a statement that the Government has permitted to appear in the daily press, and as a consequence a number of RAILWAY MAGAZINE readers have requested that details should be included in these columns, but until the War Office is agreeable this cannot be done.

It is quite natural that the existence of such a ferry should excite the query, "Does it dispense with the Channel Tunnel project?" To this question Sir Arthur Fell, M.P., in the *Daily Graphic* has contributed a decided negative. As Sir Arthur remarks, there are such ferries in the Baltic, from Germany to Denmark; in the Mediterranean, from Sicily to Italy; and in the United States, on the Great Lakes. These ferries are running successfully, and that across the Straits of Messina, uniting Sicily with Italy, has proved of great benefit to Sicily, and enabled the oranges and lemons of that country to be exported at a profit to Italy and to Central Europe.

The Tides at Dover and Calais.

THESE railway ferries have, however, little in common with a ferry across the Straits of Dover. They all run in seas where there are no tides, and as the rise and fall of the tides at Dover and Calais is about 20 ft., it is clear that to run heavy trains on to ships at either of these ports presents difficulties which do not exist in the Mediterranean ferries. The passenger casually notes that on alighting from the train at Dover he sometimes has to clamber up a gangway to the deck of the steamer, while at other times he descends a steep gangway on to a deck far below him. In the Mediterranean or Baltic the steamer's deck would never be more than 6 in. or a foot above or below the railway line.

This difficulty can be overcome by engineers, but it costs money and occasions delay, and the public will be glad to learn how far and by what means the Government have solved it. If the ferry service is tidal and the hour of departure varies each day with the tide, then the value of the service is much diminished. This may not be of so much importance with goods trains, but it would be fatal to an effective passenger or mail service to the Continent, and even trains conveying fruits, flowers, and other perishable goods would lose half the value of those which arrived at fixed hours to catch the morning markets.

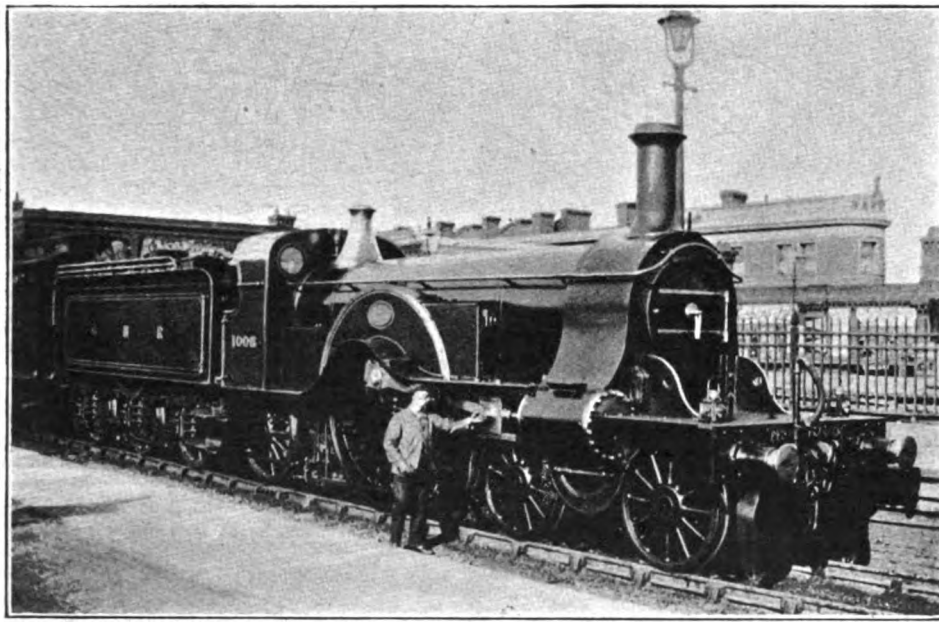
Another difficulty for an effective ferry across the Channel is the stormy and foggy sea to be traversed. The present service of mail boats is only conducted with the greatest difficulty during the winter gales and fogs. Small handy steamers only are then run, and they make the French harbours with considerable risk. How far ferry steamers capable of carrying a train of heavy sleeping and dining cars could cross in bad weather remains to be seen. The French harbours are so small, and the English also, with the exception of Dover, that ocean-going steamers could not be used unless an immense outlay were incurred in creating a new port in France, and the time and risk of building breakwaters is such as to be an almost insuperable obstacle, for they would cost millions of money and take many years' time, and in the end, when the tunnel is built, it will all have been money thrown away.

The last and greatest difficulty is, however, the fact that a Channel Ferry will have no effect on the painful bugbear of sea-sickness. That is the real deterrent to foreigners visiting this island. They will not make the sea voyage here when they can travel to other lands without discomfort. The ferry steamers with the trains on board will pitch and roll as the present ones do, and sea sickness will be just as rife among the passengers in a railway carriage which rises and falls as among those on the deck or in the cabins of a steamer. To continue in a railway carriage under such conditions, or to travel afterwards in it to Paris or Switzerland, is unthinkable. The ferry boats, however, will have cabins, and the passengers will alight and shelter in them or on deck during the passage.

From London to European Capitals.

THE only benefit passengers will derive from the ferry service will be the saving of the trouble of leaving the train with the hand

Digitized by Google



GREAT NORTHERN RAILWAY.

4-2-2 engine, No. 1008, on train at Finsbury Park.
(*From an old photograph.*)

baggage and walking to the steamers, and the same on the arrival at the other side. For goods traffic it will be a great help, and it will partly meet the Italian demand for improved facilities if they are to trade with us instead of with the Central Powers.

London will never be the railroad centre of Europe and the terminus of the great express services to the European capitals, unless the trains can run throughout on railways, and not have to be delayed and broken up for a sea voyage an hour after they have started from London.

These seem to be some of the reasons why a Channel Ferry can at best be no more than a stopgap or substitute for the link which is necessary to connect the British railway system with that of the Continent. The military side of the question is not referred to; but it is obvious that ferry steamers will in war be liable to attack by warships and submarines, and the value of safety of the tunnel comunication will be lost. It may also be noted that it would require a fleet of over 100 ferry boats to carry the trains which could pass through the tunnel in a day.

Digitized by Google

As announced in the August RAILWAY MAGAZINE, Mr. James M'Laren has succeeded Mr. John Cathles as Secretary to the North British Railway Company. Mr. M'Laren, whose portrait appears on this page, is a native of Kirriemuir, and he is a qualified law agent. His previous position in the service of the North British Railway was that of Chief of the Conveyancing Department in the Solicitor's office.

* * *

WE deeply regret to record that Lieut. Follett Hallett Holt, aged 20, has been killed in action. Lieut. Holt was the elder son of Mr. Follett Holt, Chairman of the Entre Rios Railway, who is well known to many RAILWAY MAGAZINE readers in the Argentine Republic.

* * *

WE regret the sudden death of Mr. John Harold Burman, M.Sc., Assoc.M.Inst.C.E., Assistant to the Superintendent of the Line, Lancashire and Yorkshire Railway. The interment, which took place at Manchester Crematorium on Thursday, September 5th, was attended by a large number of railway officials, including Messrs. W. B. Worthington, formerly Chief Engineer; R. C. Irwin, Secretary; H. Shelmerdine, Land Agent; W. H. Coomber, Assistant Engineer; S. Hauxwell, Assistant Superintendent of the Line; R. Sadler, Accountant; J. Redford, Chief Cashier. The late Mr. J. H. Burman was born at Cowes, Isle of Wight, in 1879, and educated at Seaford College, Sussex, and Mill Hill School, London. Matriculating at London University in June, 1895, he proceeded to Owens College (Victoria University), Manchester, and graduated B.Sc., with honours in Engineering, in July, 1898, taking the M.Sc. degree in 1901. He was articled in November, 1898, to Mr. W. B. Worthington, M.I.C.E., then Chief Engineer of the Lancashire and Yorkshire Railway. From 1900 to 1903 he was engaged upon the construction of the new line from Kirkham to South Shore, Blackpool, and on its completion was transferred to the Chief Engineer's office at Manchester, where he was principally engaged in supervising the laying and maintenance of the electric track equipment in the Liverpool district. In November, 1909, he was appointed Divisional Engineering Assistant for the Yorkshire Division of the line, which position he filled until June, 1914, when he was appointed Assistant to the Superintendent of the Line.

Photo] [*Lafayette.*

MR. JAMES M'LAREN,
Secretary,
North British Railway.

* * *

DEATH has occurred at Edinburgh of Mr. John Thompson Oliver, formerly Chief Assistant Engineer of the North Eastern Railway. Mr. Oliver, who retired on December 31st, 1913, was in the N.E.R. service for the long period of 56 years, during which various great engineering works were completed in the Northern Division, including the construction of many new lines, especially in the county of Durham, and the widening of the old ones; new coal-shipping staiths on the Tyne and at Blyth; two great bridges over the Wear, viz., the old bridge at Monkwearmouth, completed 1879, and the Alexandra Bridge, higher up the river, opened in June, 1909; the King Edward Bridge over the Tyne, opened in 1906. During the same period, there was

Digitized by Google

accomplished the notable work of widening the line between Manors and Heaton (completed 1887), including the duplication of the bridge over Ouseburn, and also the widening between Central Station and Manors, Newcastle (completed 1894), which necessitated the building of a lofty granite arch of 106 ft. span over Dean Street, alongside the old arch of 1848.

* * *

MR. F. J. PICKERELL, who prior to joining the Navy was a privilege apprentice to engineering at the Midland Railway Locomotive Works at Derby, is mentioned in Sir Roger Keyes' despatch among those who "volunteered for the very hazardous service and distinguished themselves in the *Vindictive* on the night of May 9-10." In an Admiralty report it is announced that the King has approved the award of the Distinguished Service Medal to him in recognition of such service.

* * *

WE understand that Mr. A. E. Waterson, who is in the service of the Midland Railway at St. Mary's goods station, Derby, has been adopted as Labour candidate for the newly-formed Kettering Division of Northants. He has long been prominent in the Labour movement in Derby, and acted as Secretary of the local Committee in the railwaymen's strike in 1911. He has been a member of the Derby Town Council since 1913.

* * *

MR. R. ROSTRON, of the London and North Western Railway Cashier's Department, has retired after 52 years' service. He has not missed one day's service through illness; a truly remarkable record.

* * *

MR. F. J. CLARK, Secretary to the Agent of the Great Indian Peninsula Railway Company, has retired from that service. The sixth son of the Rev. William Clark, Missionary of the Church Missionary Society, in South India and Ceylon, Francis J. Clark was born at Kottayam, Travancore, on May 14th, 1864. He joined the service of the Great Indian Peninsula Railway in August, 1885, as Assistant Accountant in the Chief Engineer's office, and in November, 1901, was transferred to the Agent's office, and appointed First Assistant Secretary to the Agent, from which position he was promoted to Secretary to the Agent in January, 1912. To succeed him Mr. J. Scott, Assistant Auditor and Accountant, has been appointed Acting Secretary to the Agent, and Secretary of the Great Indian Peninsula Railway Co-operative Credit Society.

* * *

RECENT railway obituary includes Mr. Henry J. Pryce, M.Inst.C.E., who at the time of his retirement from railway service was Locomotive Superinendent, North London Railway. Mr. Pryce was born in Hereford 66 years ago, and served his time at the Inchicore Works of the Great Southern and Western Railway, whither his father had meanwhile removed. When Mr. J. C. Park went from Inchicore in 1878 to the North London Railway as Locomotive, Carriage and Wagon Superintendent, Mr. Pryce joined him as his Assistant. In 1878 the latter became the Signal Superintendent, and in 1884 Signal and Telegraph Superintendent, and, when the late Mr. Park retired in 1893, was appointed to succeed him, retaining also the duties of

THE LATE MR. HENRY J. PRYCE, M.INST.C.E.

the Signal and Telegraph Department. This position he held until the London and North Western took over the North London Railway in 1909, when he retired. Mr. Pryce was one of the two founders in 1891 of the Conference of Railway Companies' Signal Superintendents and Engineers, and its first Secretary; was the inventor of the Park and Pryce train protection bar which was extensively used before the adoption of electrical bars and track circuits, and joint inventor of the Pryce-Ferreira block instrument.

* * *

THE Garden Plots Committee of the London and South Western Railway held the second annual London District Staff Vegetable Show at Brunswick Institute, Vauxhall, on the first Wednesday and Thursday in September. The show was opened by Sir William Portal, Deputy-Chairman of the Company; and the chief prizes were won by Signalman Mills, of Richmond, and Platelayer Cox, of Clandon. Some 7,000 allot-

Digitized by Google

ments have been cultivated on waste ground alongside the line by the railwaymen this year. The proceeds of the show will be devoted to the London and South Western Railway Servants' Orphanage funds.

* * *

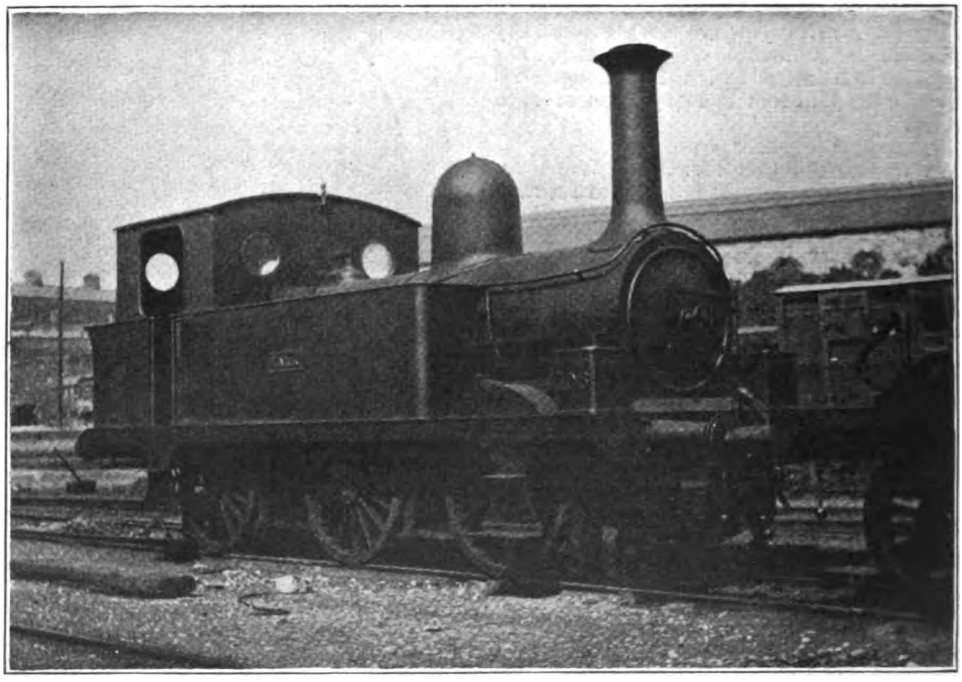
PRIZES in the competition for the best-kept and most attractive platform flower gardens or borders on the Glasgow and South Western Railway have been allocated. The awards are divided into five classes, the prizes in each being respectively £5, £4, £3, £2, and £1. There were 12 successful competitors in the first class, 10 in the second, 10 in the third, 5 in the fourth, and 10 in the fifth. The following were the prize-winners in the first class:—£5 each—Drybridge, Mr. Wm. R. Becket; Closeburn, Mr. James Houston; Holywood, Mr. David Kelly; Maxwelltown, Mr. William Nicholson; Dalmellington, Mr. John Inglis; Glenside, Mr. William Paterson; Dalbeattie, Mr. Thomas Coyle; Alloway, Mr. Charles Auld; Carronbridge, Mr. Robert Muir; Cunninghamhead, Mr. James Dunlop; Paisley (West), Mr. Alexander Leslie; and Dumfries House, Mr. John Rae.

* * *

SOME noteworthy particulars regarding the handling of American troop trains on this side of the Atlantic have just been published in a weekly newspaper. On one day in July, 19 trains, of 220 coaches, carried 10,320 men from an American camp in six hours, while as many as 25,000 troops have been entrained and transported from one town in less than five hours. Of particular interest is the opinion of American railway transport officers of the British railways. British coaches, they consider, are better adapted for the quick loading of troops than the long American open cars, and the British vehicle, with its numerous entrances and small compartments, is described as seeming "to have been built especially for ease in loading columns of fours." The outstanding feature of the carriage of American troops on our side of the ocean is that the American officers who are in charge of the operations, despite the handicap of undertaking their duties in a strange country and under unfamiliar conditions, are surpassing the best transportation feats recorded in the United States of America.

* * *

IMPROVEMENT of rural transport in the county of Aberdeen was considered at a recent conference between representatives of the Rural Transport (Scotland) Committee and representatives of the local authorities, includ-



Photo] [*J. Macartney Robbins.*

MIDLAND GREAT WESTERN RAILWAY.

0-6-0 tank locomotive, No 106, *Lark*, at Broadstone, Dublin, waiting for repairs.

Digitized by Google

ing the Great North of Scotland Railway Company. Sir T. Carlaw Martin presided, and the other Commissioner present was Sir William F. Haldane. The proposals considered were a light railway between Ballater and Braemar, a light railway between Aberdeen and Echt and Skene, a light railway between Aberdeen and Newburgh, a light railway between Aberdeen and Methlick and Tarves *viâ* Udny, and a light railway between Alford and Bellabeg.

* * *

MR. D. H. STUART states that London Brighton and South Coast engine, No. 46, *Prince of Wales*, is being rebuilt with an extended smokebox and a Schmidt superheater of 21 elements. No. 47 has been rebuilt with a short smokebox, and No. 56 has got the new funnel.

* * *

CONCERNING the recent visit of the Prime Minister to the North, Mr. F. Stevens furnishes the interesting note that Mr. Lloyd George occupied an eight-wheeled saloon on the 2.10 p.m. train from Euston, September 11th, the train engine being "Prince of Wales" class locomotive, No. 892, piloted by "George V." class, No. 226, *Colwyn Bay*.

* * *

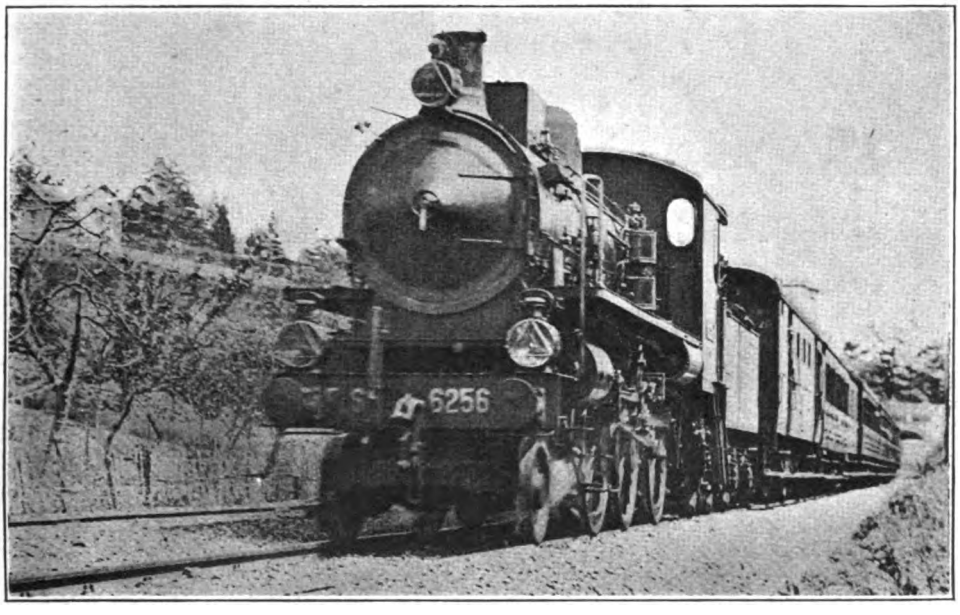
MR. M. D. GREVILLE presided at the September general meeting of the members of the Railway Club. In the unavoidable absence of Mr. G. W. J. Potter, Mr. A. W. Bartlett read a paper by the former, entitled "Railway Rules and Regulations in 1852."

* * *

A COLLISION occurred at Heaton Lodge Junction, about 3 miles from Huddersfield, in the early hours of Saturday morning, September 7th. The trains were the London and North Western mail, which leaves Crewe, and is due to arrive at Leeds at 2.40 a.m., and a Lancashire and Yorkshire goods train, which was on its way from Goole to Brighouse.

* * *

FOLLOWING a visit to Dunbar, Mr. Lambert H. Bailey writes:—As will probably be known by RAILWAY MAGAZINE readers, there is a gradient from Dunbar to Grant's House (12 miles) which, while not particularly severe, being 1 in 70 at only a few places for short distances, necessitates assistance being given to the majority of south going goods trains, and at least in one instance to a passenger train, viz., the 7.0 train from Waverley to King's Cross. This train usually consists of about 17 coaches, including several ordinary and one postal van, and is well filled with civilian and military passengers. It is usually headed by a large N.E.R. Atlantic, and from Dunbar is pushed by one of several 4-4-0 engines which are kept there for that purpose. The goods trains consist of 40 to 50 vehicles of all descriptions, generally nearer the latter figure, and are in most

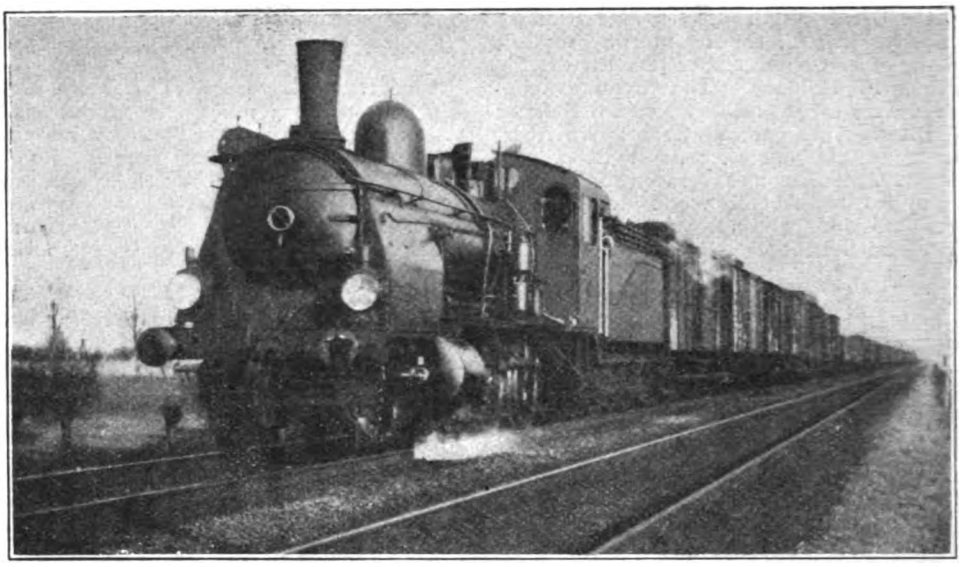


Photo] [*J. Macartney Robbins.*

ITALIAN STATE RAILWAYS.

2-6-0 superheater locomotive, No. 6256, on train near Florence.

Digitized by Google



Photo] [*W. H. C. Kelland.*

ALSACE-LORRAINE 2-6-0 2-CYLINDER COMPOUND ENGINE ON GOODS TRAIN AT LINGOLSHEIM.

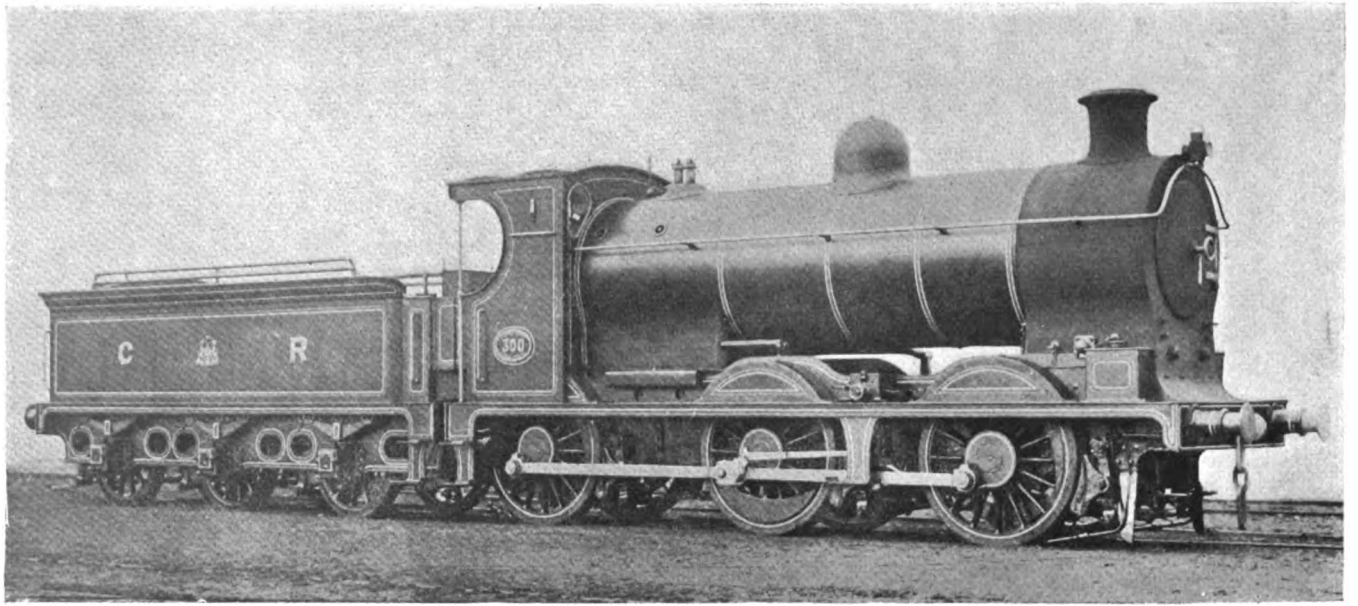
cases assisted up the bank. On one occasion at Innerwick, 4½ miles beyond Dunbar, a heavy goods train arrived there unassisted, but a light engine returning met it there, and was commandeered and pushed the train from that point. One thing I saw which I have never before observed on the West Coast lines was that while the home signal at both ends of the station consists of two arms, one for the main line used by non-stopping trains, and one for the loop into the station, there was only a single arm on the distant signal, that for the main line. The object of this may be intentional, as the junctions into the station are very sharp, requiring a severe slack by trains entering the station.

RAILWAY YEAR BOOK.

One of the few really essential books of reference, in the sense that it is practically the only one of its kind, is the "Railway Year Book" (Railway Publishing Company, 5s. net), which celebrates its coming of age with the current volume. All the customary useful features are retained, there are some interesting new ones, and the contents include a very handy précis of the war-time relations between the Government and the British railways and of the special regulations now governing railway traffic.—*The Globe.*

Digitized by Google

Digitized by Google



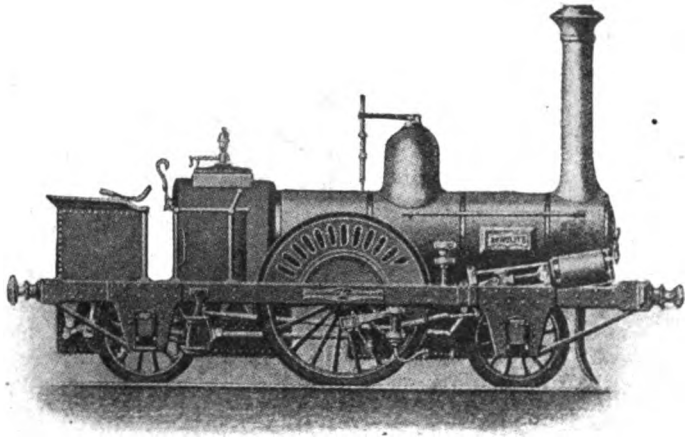
THE RAILWAY MAGAZINE.

CALEDONIAN RAILWAY NEW 0-6-0 TYPE GOODS ENGINE, No. 300.

Mr. W. PICKERSGILL, Locomotive Superintendent.

Cylinders, diameter 18½ in. Stroke, 26 in. Driving and coupled wheels, diameter 5 ft.
Total wheel base, engine and tender, 38 ft. 7½ in.
Heating surface: Firebox, 119 sq. ft.; Tubes, 1,333 sq. ft.; Total 1,452 sq. ft.
Grate area, 20 sq. ft. Water capacity of tender, 3,000 gallons. Coal capacity, 4½ tons.
Weight of engine, 49¼ tons. Weight of tender (in working order), 37¼ tons. Total weight of engine and tender, 86½ tons.

Digitized by Google



VIEW OF THE ENGINE AS SHOWN AT THE GREAT EXHIBITION OF 1851.

A Famous Mid-Victorian Locomotive.

THE "AEROLITE" TANK ENGINE, NORTH EASTERN RAILWAY.

AS now running, engine No. 66 *Aerolite* of the North Eastern Railway is a 2-cylinder compound with the 2-2-4 wheel arrangement, and it is one of the very few single-driving tank engines employed in Great Britain. The *Aerolite* was originally constructed in the year 1851 by the firm of Kitson, Thompson and Hewitson, now known as Kitson and Co., Ltd., of Leeds. It was staged at the Great Exhibition held at the Crystal Palace, then standing in Hyde Park, in the year referred to, and two of the accompanying illustrations show the engine in its original form. As seen it then had the 2-2-2 wheel arrangement with outside cylinders, the latter being placed in an inclined position alongside the smokebox. Outside framing was employed, and the tanks were placed one below the boiler barrel and the other below the fuel bunker. As the drawing shows, no shelter of any kind was provided for the enginemen.

The boiler was placed at a low level above the frames, and it had a raised firebox of the round top pattern. The safety valves were of the spring-balanced type attached to the steam dome, and the name plate was secured to the foremost ring of the barrel on each side. In its then condition the engine possessed the following leading features :—

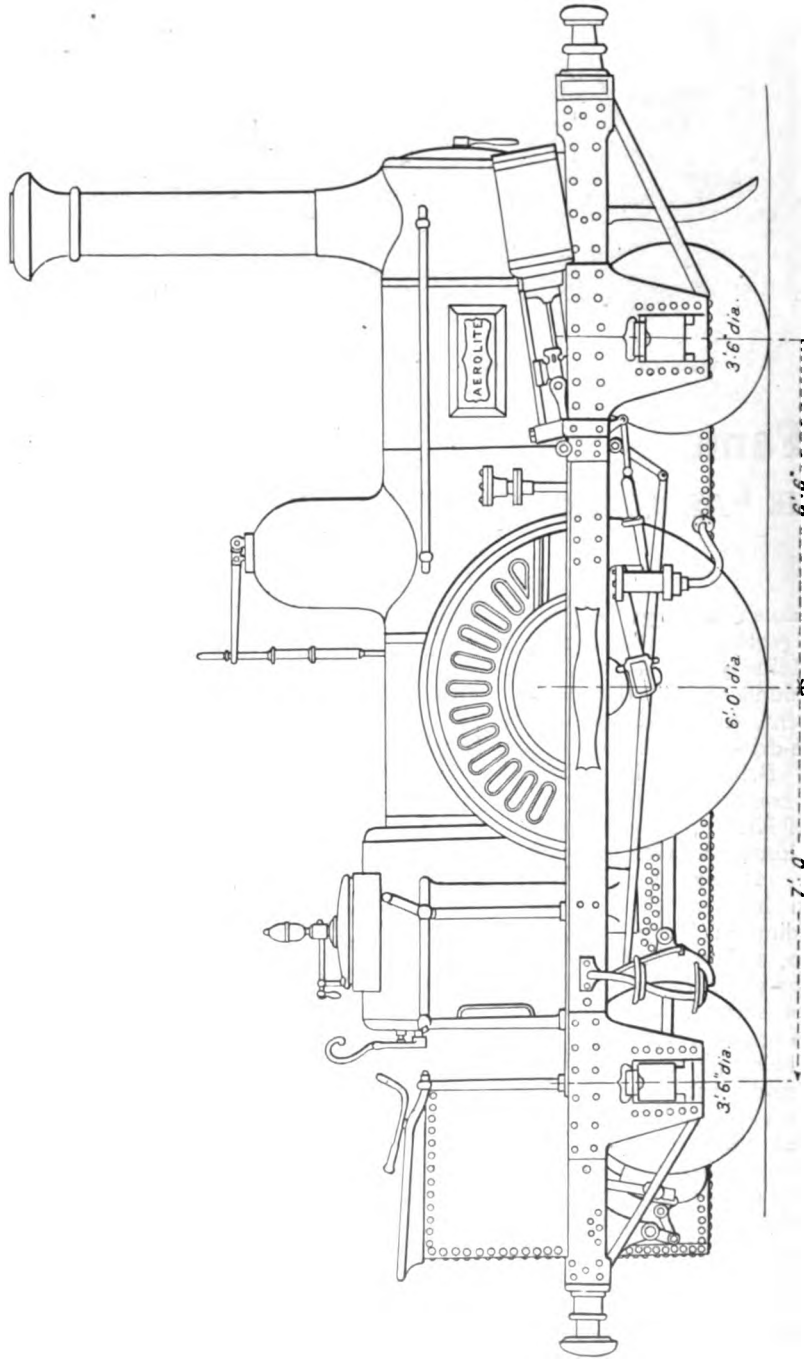
Cylinders, diameter	11 in.
Piston stroke	22 in.
Driving wheels, diameter	6 ft.
Leading and trailing wheels, diameter.	3 ft. 6 in.
Total wheelbase	13 ft. 6 in.
Heating surface, firebox...	62 sq. ft.
Do. tubes	525 sq. ft.
Do. total...	587 sq. ft.

The engine ran for many years on the Leeds Northern Railway, and, according to records, it was described as being constructed to run light express trains. The water capacity of the tank was 500 gals., and sufficient coke was carried to enable the engine to perform a journey of 50 miles without replenishing the supply. The boiler was fed by means of pumps worked off the crosshead, the drawing showing the arrangement of the mechanism.

The *Aerolite* achieved a noteworthy reputation for itself, and was a great favourite among travellers, being possibly one of the best-known locomotives in the North of England.

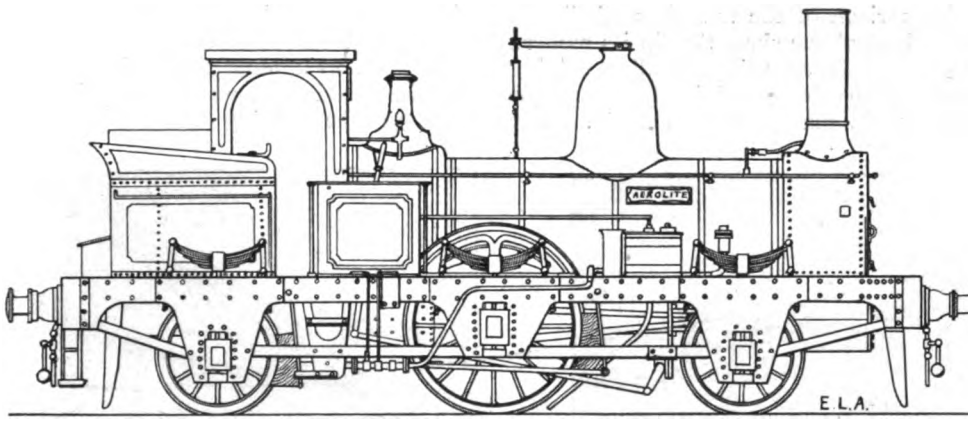
In the year 1869, having in the meantime become the property of the North Eastern Railway, it was rebuilt by Mr.

Digitized by Google



THE "AEROLITE" AS ORIGINALLY BUILT IN 1851.

Digitized by Google

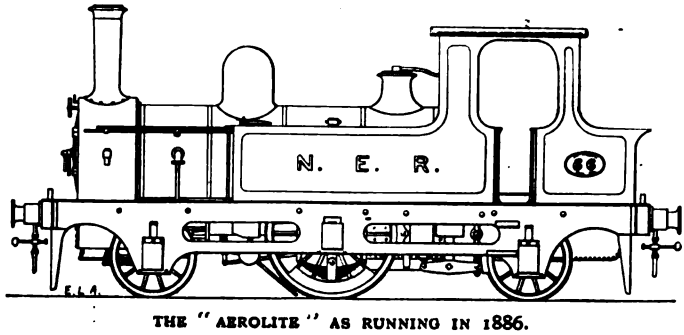


THE ENGINE AS REBUILT BY MR. FLETCHER ABOUT 1869.

Fletcher in the form shown in the second drawing, the cylinders, 13 in. by 20 in., being located between the frames, instead of outside as before. In 1886 the then Locomotive Superintendent, Mr. T. W. Worsdell, fitted the engine with new outside frames, and side tanks, the 2-2-2 wheel arrangement being still retained. In 1907 it assumed its present form, as shown in the accompanying photographic illustrations, and there need be no hesitation in saying that, as now running, it is the smartest looking tank engine of its size on any of the British railways; indeed, with its present style of finish, general proportions and clean-cut appearance it forms about as neat an example of tank design as can possibly be imagined. The name plates are attached to the tanks on each side, and the number plate on the side of the bunker still records the fact that the engine was originally built by Kitson, Thompson and Hewitson, Leeds, that in 1851 its number was 281, and that it was rebuilt at Gateshead in 1907.

The principal particulars are as follows:—

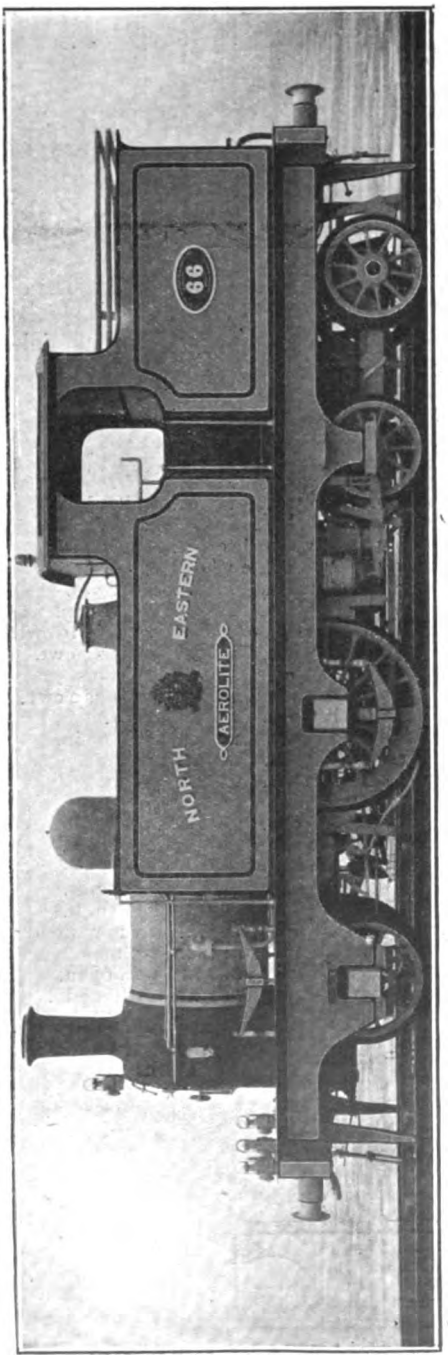
Cylinders, h.-p.	13 in.
Do. l.-p.	18½ in.
Piston stroke	20 in.
Driving wheels, diameter	5 ft. 7¾ in.
Leading wheels, diameter	3 ft. 7 in.
Bogie wheels, diameter...	3 ft. 1¼ in.
Wheelbase, total	20 ft. 7 in.
Do. leading to driving wheels ...	7 ft. 8 in.
Do. driving to front bogie wheels	7 ft. 8 in.
Do. bogie	5 ft. 3 in.
Length over buffers	32 ft. 6 in.
Weight of engine in working order.	44 tons 19 cwt.
Do. on leading wheels	9 tons 7 cwt.
Do. on driving wheels	19½ tons
Do. on trailing bogie	16 tons 2 cwt.
Boiler, length of barrel...	10 ft.
Do. diameter of barrel	3 ft. 9¾ in.
Do. tubes, number	148.
Do. do. diameter	1⅞ in.
Heating surface, tubes	750 sq. ft.
Do. firebox	65 sq. ft.
Do. total	815 sq. ft.
Grate area	11 sq. ft.
Tank capacity	1,620 gallons.
Bunker capacity	2.5 tons
Height to centre of boiler	6 ft. 6⅞ in.
Height to top of chimney	12 ft. 0⅜ in.



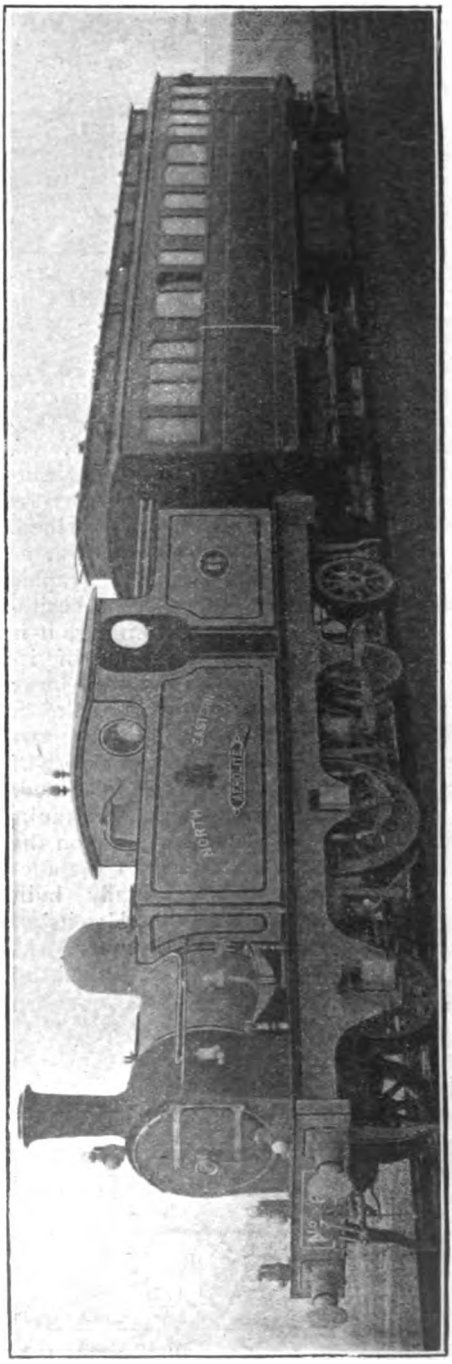
THE "AEROLITE" AS RUNNING IN 1886.

Digitized by Google

Comparison of the two lists of dimensions given above show that in its modern form the *Aerolite* has smaller driving wheels than those originally fitted, the difference in diameter being 4½ in. The diameter of the leading wheels has, on the other hand, been slightly increased—3 ft. 7 in. as against 3 ft. 6 in. It will also be noted that, as now running, the load on the driving wheels is 19 tons



THE "AEROLITE" REBUILT AS A 2-CYLINDER COMPOUND AT GATESHEAD IN 1907.



THE "AEROLITE" ATTACHED TO THE NORTH EASTERN RAILWAY OFFICIAL SALOON.

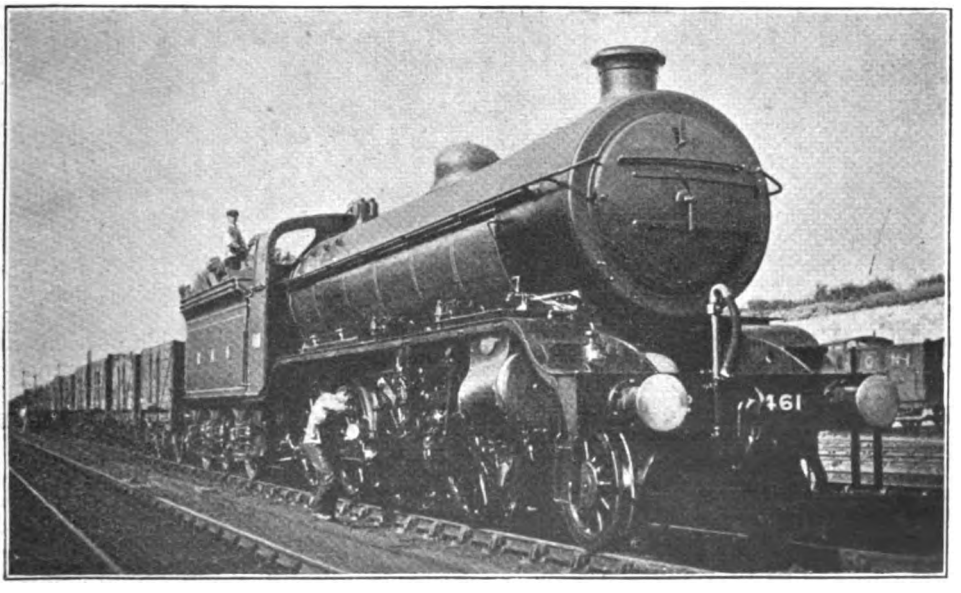
Digitized by Google

10 cwt., which represents about the ordinary limit for adhesion weight on a single pair of wheels for railways in this country. The North Eastern Railway, however, leads in this matter of adhesion, as in its R1 class 4-4-0 express engines the driving pair of wheels carries no less than 20 tons 18 cwt.

The *Aerolite* is equipped with Westinghouse brake appliances and steam sanding fittings. Brake blocks are applied to the bogie wheels as well as the driving wheels. The engine is used for hauling the special saloon carriage which conveys the Chief Mechanical Engineer of the company on inspection trips and other journeys. One of the illustrations show it attached to the saloon.

Thanks are due to Mr. A. C. Stamer, Acting Chief Mechanical Engineer of the North Eastern Railway, for photographs of the engine as now running, and Kitson and Co., Ltd., of Leeds, for the illustrations showing the engine in its original form. To the well-known locomotive historian and RAILWAY MAGAZINE contributor, Mr. E. L. Ahrons, we are indebted for the drawing showing the *Aerolite* as rebuilt by Mr. Fletcher about 1869, and for the drawing illustrating the engine as running in 1886. In regard to the latter, it will be noted that the plate bearing the name "Aerolite" was removed when the engine took this form, and it will be further seen that whilst the 2-2-2 wheel arrangement was retained a different style of framing was adopted consisting of a solid slotted-out plate. Mr. Ahrons points out that there are some grounds for believing that the engine in the form thus illustrated may be defined as a rebuild by Mr. T. W. Worsdell of the 1869 engine, since many of the parts of the latter, including the inside frame, were, he believes, used again. The drawing shows the engine with side tanks, in addition to which there was a tank between the frames at the trailing end.

TAKING WATER AT HITCHIN.



Photo] [*F. H. Stingemore.*

GREAT NORTHERN RAILWAY.

New 3-cylinder 2-8-0 locomotive, No. 461.

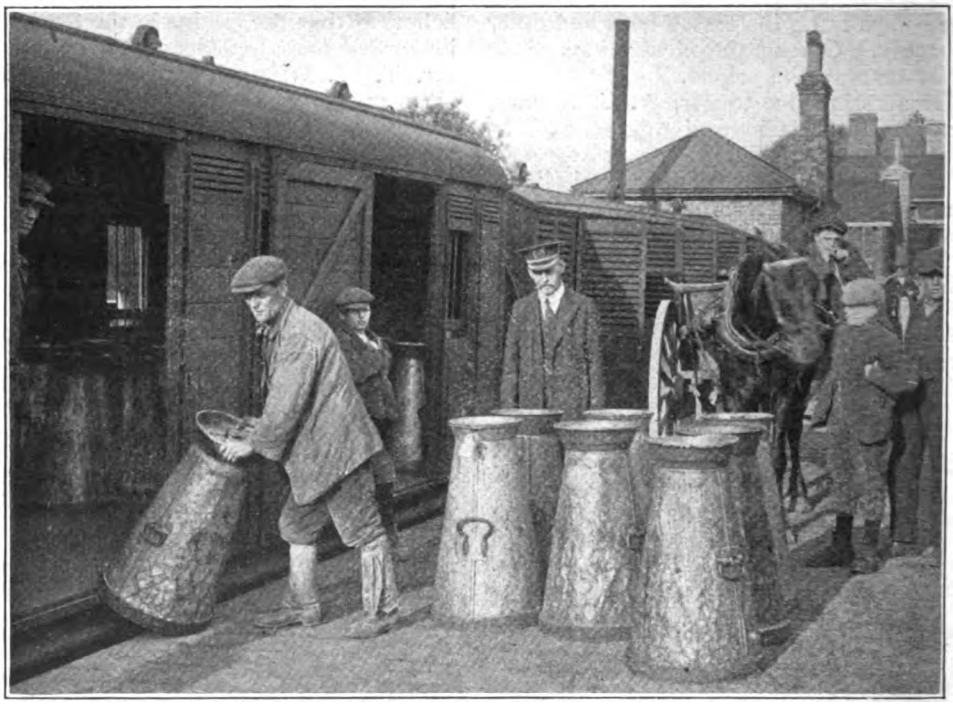
Digitized by Google

Milk Traffic on the Ongar Branch, Great Eastern Railway.

AS readers of THE RAILWAY MAGAZINE are aware, the Great Eastern Railway serves a number of agricultural districts of large extent in the eastern portion of England, and a considerable amount of traffic in milk and farm produce of all kinds is handled by the Company. Where the milk traffic is concerned, special trains are run in some of the districts, and a representative of THE RAILWAY MAGAZINE was recently afforded by the courtesy of the late Mr. Wm. C. May, Chief Traffic Manager, facilities for observing the methods employed in connection with milk traffic on the Ongar branch.

As long ago as 1911 milk traffic on this section was of a heavy character, and still increasing. It was, therefore, decided to commence running milk and stock trains each weekday to and from Ongar in that year. Two trains containing empty milk cans leave Stratford for Ongar, one at 5.40 a.m. and the other at 3.39 p.m., due at their destination respectively at 7.6 a.m. and 4.55 p.m. Empty milk churns are unloaded at the various stations en route, whilst a considerable portion travel forward to Ongar itself, the terminal station on the branch. The return, loaded, trains leave Ongar for Stratford at 8.30 a.m. and 6.46 p.m., calling at intermediate stations to Theydon Bois for full churns of milk and stock traffic, several churns being unloaded at stations from Buckhurst Hill to Leyton inclusive, but the majority travel through to Stratford.

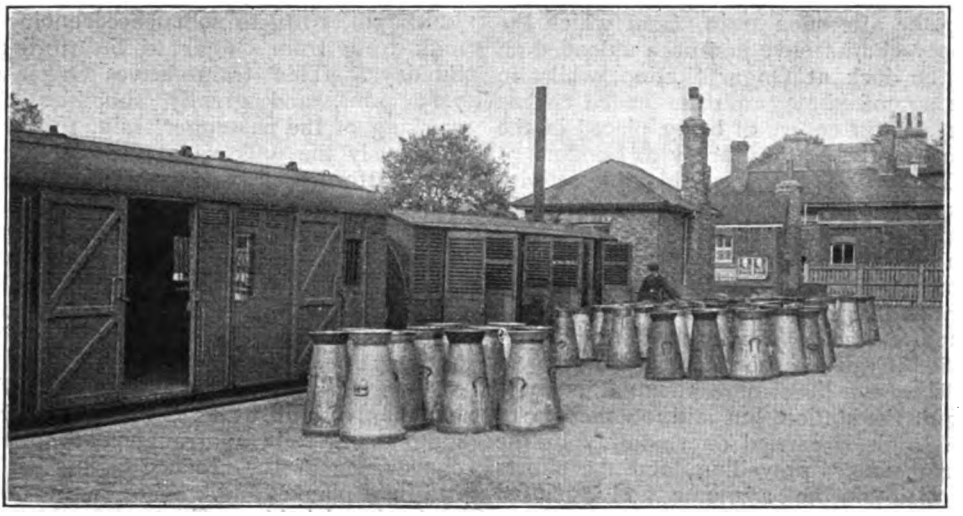
The Ongar district contributes on an average 1,295 churns of milk weekly, loaded at Ongar Station, each churn



Photo] [*Chas. S. Lake.*

LOADING TRAIN WITH MILK FOR LONDON.

Digitized by Google



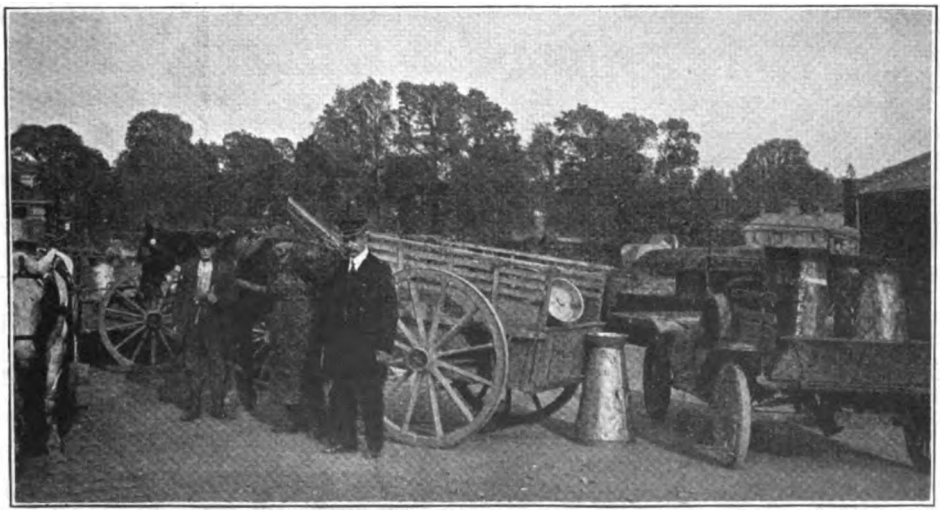
Photo] [*Chas. S. Lake.*

EMPTY CHURNS UNLOADED AT ONGAR FROM DOWN MILK TRAIN.

containing approximately 17 imperial gallons. The milk is brought to the station by thirty-six carts and wagons of varying descriptions, some of them being farmers' drays, whilst in one or two cases motor vehicles are employed. They converge on the station from north, south, and east, some of the carts having to perform a journey of five miles each way between farm and station, whilst in one instance eight miles has to be covered in each direction in the road conveyance of the milk, a journey which entails considerable difficulties at times during the worst of the winter weather.

The majority of the morning carts do not arrive until about ten minutes before the train is due to leave, but in practically every case the train is got away punctually, and this in spite of the depleted staff at present available.

The trains are made up of milk and stock vans, and the first of the photographs shows two of the vehicles compris-



Photo] [*Chas. S. Lake.*

LOADING FARMERS' CARTS WITH EMPTY CHURNS AFTER DEPARTURE OF A MILK TRAIN.

Digitized by Google

ing the afternoon train, from which the empty churns have just been unloaded on to the dock at Ongar Station, whilst in the second photograph the loaded churns are seen in course of being placed in the vans for the return journey to London.

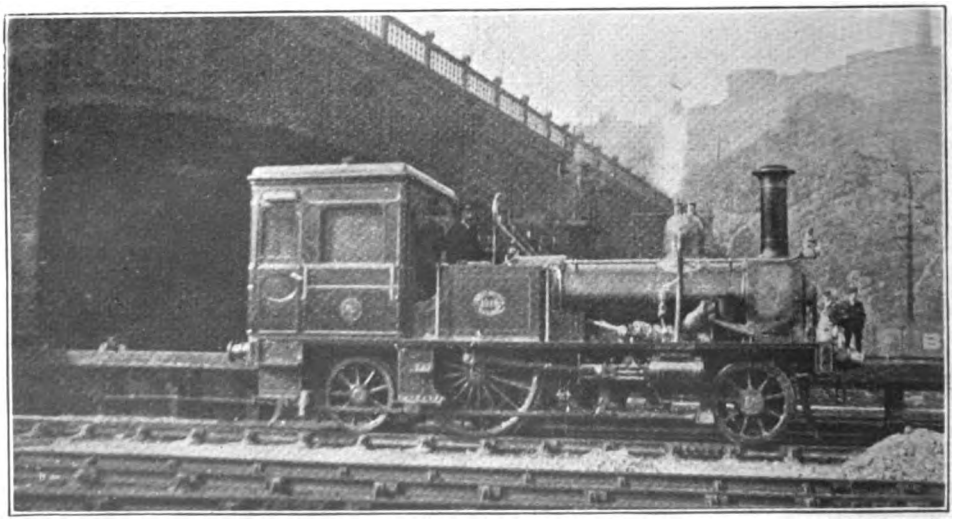
The scene is one of considerable activity during the periods of loading and unloading, and this is repeated on a smaller scale at several of the intermediate stations. From observation the work is performed in a smart manner by the railway employés, and it would certainly be simplified if those responsible for bringing in milk were a little more punctual in arriving at the station, but still, on the whole, the traffic is carried on smoothly in the circumstances prevailing, and the efforts to maintain an adequate and punctual service have certainly been very successful.

Owing to the success of the weekday milk train service it was decided, as from June 25th, 1916, to commence running a milk train from Ongar to Stratford on Sundays. This train leaves Ongar at 7.15 p.m., and greatly simplifies the working of the passenger train, to which previously the milk vans were attached. At Stratford some 5,000 churns per week arrive, and are handed over, and in addition there are a large number of transhipping churns to be dealt with. One of the largest concerns handing over milk to the Great Eastern Railway is the Eastern Counties Dairy Farmers' Co-operative Society.

As a feature of railway working, the handling of milk traffic is of considerable interest, the railway arrangements for the conveyance of the produce having to be carefully planned, milk being in the front rank of perishable traffic.

Mr. N. Probst, Stationmaster at Ongar, kindly explained to our representative the method of handling traffic at that station.

NORTH BRITISH RAILWAY.



Photo] [*W. R. Rainnie.*

DIRECTORS' CAB AT WAVERLEY.

Digitized by Google

Locomotive and Train Working in the latter part of the 19th Century.

GREAT EASTERN RAILWAY. [No. V.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN the middle "'eighties" there was on many railways a revival of the "single" express engine, which until then had been rapidly dying out except on the Great Northern and Great Western. The Midland locomotive authorities had in 1886 experimented with and brought to success the "sand blast." The initial experiments took the form of uncoupling the wheels of some 2-4-0 engines and running them as single express engines. As a result of this they put into service the fine single-wheelers so long famous on the Midland. The Great Eastern also thought that they might as well give the sand blast a trial, and in June, 1888, the side rods were removed from the Cambridge 2-4-0 engine, No. 721, which was put to work on the "joint line" as a single-wheeler. The result was the construction in 1889 of the first of Mr. Holden's single engines, No. 789, which in 1892 was renumbered 780. This engine was exactly the same in nearly all its details as the 710 class, but the trailing coupled wheels were replaced by small carrying wheels. The design was somewhat unusual in that the leading carrying wheels, like those of the 710 class, had outside bearings, whilst the trailing carrying wheels had inside bearings only. After remaining at Stratford for a short time for experimental purposes, the new single was sent to Cambridge to work over the Doncaster road. In 1891 ten more of the class were built, of which 770 to 775 were sent to Doncaster, and 776 to 779 were quartered at Cambridge. Like the 710 class, they had 7 ft. driving wheels, and 18 in. by 24 in. cylinders, with 140 lb. pressure. They superseded the Bromley singles on the joint line, and for some years did the greater part of the express work over this section. In 1893 ten more of the same class were constructed, but with an increase of boiler pressure to 160 lb. Of these Nos. 1000 went to Doncaster, 1001 to 1003 to Cambridge, 1004 to 1006 to Norwich, and 1007 to 1009 to Parkeston Quay.

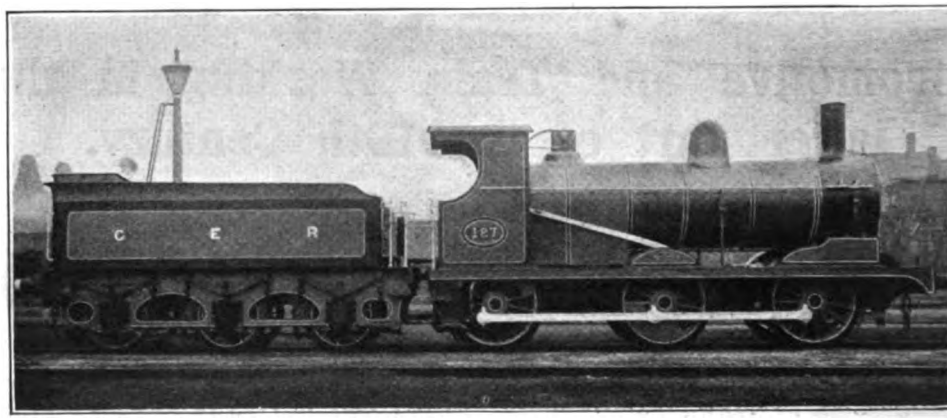
Before dealing with the work of these engines, I may add at this point that in 1893 the Great Eastern commenced to run their trains through to York, and No. 1000, together with some of the 770 class, were stabled in the North Eastern shed at York. I will, however, leave further consideration of the joint line alterations for the moment, and return to the subject later.

When the through London to Cromer expresses were put on in 1896, engines 1004 to 1009 were supplied with tenders with water scoops, and arranged to burn liquid fuel. Nos. 1004 to 1006 remained at Norwich for this work, and 1007 to 1009 were removed from Parkeston Quay to Ipswich.

The Great Eastern was the only line on which the respective merits of single and coupled engines could be fairly tested, for although there were single and coupled engines on other lines, those on the Great Eastern were the only ones with exactly the same general dimensions throughout, the only difference being the absence of the coupling rods. I cannot do better than quote a paragraph of Mr. Rous-Marten's report of 1898 on "British Express Engines" made for the International Railway Congress:—

"Comparing the work of Mr. Holden's 'coupled' and 'single' engines, my experience has been exactly the reverse of what would have been predicted on 'a priori' theory. One would have anticipated that the coupled engine, with its larger adhesion weight, would beat the single-wheeler in pulling heavy loads and in ascending steep gradients, but that the

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

0-6-0 GOODS LOCOMOTIVE, NO. 127.

The only 2-cylinder compound goods engine on the Worsdell system (designed by Mr. James Holden). Built at Stratford, 1887.

Wheels, 4 ft. 11 in.; H.P. cylinders, 18 in. by 24 in.; L.P. cylinders, 26 in. by 24 in.

free-running single-wheelers would attain the higher speed on the level or on falling gradients. My experience in practice has been exactly the reverse. The 'single' engines beat the coupled ones with big loads and uphill, but the coupled engines ran at higher velocities downhill. While, however, I place on record these definite facts, I do not mean to deduce from them any absolute principle of superiority. My deduction is rather that one type is as efficient as the other if each locomotive be well designed and properly proportioned."

As I kept no records of my own of the 1000 class on the Cromer expresses, I must again fall back upon the same writer who in the same report to the International Railway Congress gives one of his own experiences:—

"On the date of my experimental journey with the Cromer express, the load was approximately 170 tons. There was a strong side wind, and immediately after starting an adverse gradient of 1 in 70 had to be faced for ¾ mile, but the engine took the 170-ton load up this bank with the utmost ease, the first 1¼ mile from the start at the foot of this incline being done in 3 min. 5 sec. Later, ascending the gradient of 1 in 84 near Brentwood, a speed of 31.1 miles an hour was maintained. In spite of four bad checks for signals and relaying, which caused a delay of fully 7 min., Ipswich (68¾ miles from London) was passed in 83 min. 49 sec., and the distance of 114 miles from London to Trowse Junction occupied 134¾ min., from which 9 min. should be deducted for delays by five slackenings. The remainder of the journey being on a branch single line with severe grades and frequent slowings to exchange the staff, no opportunity was afforded for striking work, but North Walsham, the first stop, was reached in 2 h. 42 min. from London, virtually 2 h. 33 min. if allowance be made for the slackenings other than the regular service slowings at Ipswich, Trowse, and various staff stations. The performance was exceedingly good for an engine with relatively small tractive force, taking a considerable load over a heavy road with a strong side wind blowing. On the return journey with the same engine and train the speed rose to 70 miles an hour several times, as against a maximum of 65.4 on the down journey, and the train had reached a point 15 miles from London 7 min. before time, but subsequent signal slacks absorbed all this gain. The distance of 99 miles from passing Trowse swing-bridge at a slow walking pace to the signal check at Harold Wood was run in 112 min., with a midway slack at Ipswich, and with a load of 170 tons. Water was picked up twice each way while running at full sped. On another occasion one of these engines kept time

Digitized by Google

from London to Colchester with an express of 20 six-wheeled coaches, weighing about 260 tons, the inclines of 1 in 70 and 1 in 84 being ascended without difficulty."

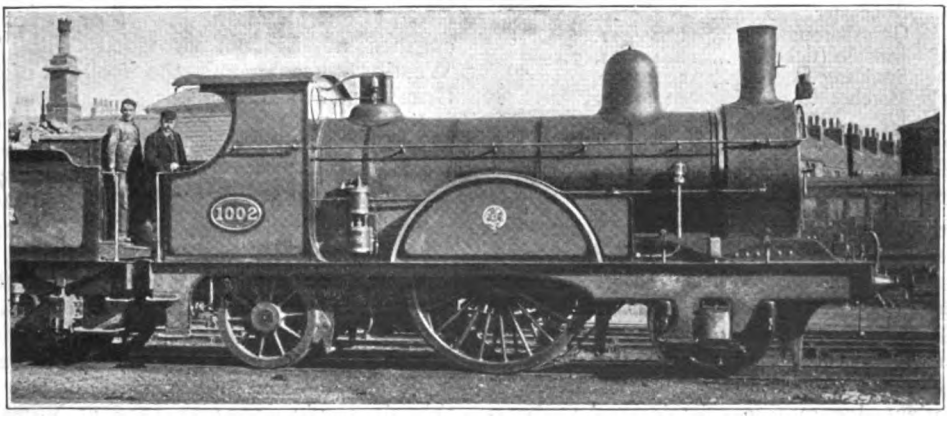
A few lines may now be devoted to the gradual improvements in the speeds of the Great Eastern expresses. In 1888, as compared with five years earlier, there was not any phenomenal advance in the matter of speed over most sections of the line, but the best trains over the London-Cambridge-Doncaster section maintained a high average. On the other hand, there was a marked advance in the number and mileage of express trains. Taking the two main lines of this railway separately, Foxwell (1888) records that on the London-Cambridge-Doncaster section there were 28 expresses, with a total daily mileage of 2,499, averaging 40¾ miles per hour inclusive of stoppages, and 43.6 miles per hour running average, exclusive of stops. The coast line *via* Ipswich and Norwich provided 24 more expresses, with a total mileage of 1,673, at 40½ m.p.h., including stops, and 41¾ m.p.h. running average. The total was 52 express trains, with a journey speed of 40.6, and a running average of 42.8 m.p.h. Compared with five years earlier, there was an increase of 18 express trains, but the average speed of the greater number in 1888 was slightly below that of 1883.

But to do this line justice, it is but fair to quote a paragraph of Foxwell in 1888, as follows:—"The actual running on the Great Eastern is very much faster than would appear from the average speeds given, because this average is spoilt by an exceptionally large number of sharp curves, junctions, swing-bridges, &c., which require reduced speed; and the first 6 miles out of London are a great stumbling block. On the other hand, the Great Eastern is almost continental in its punctuality; every day expresses arrive at Cambridge or Liverpool Street a minute or two before their time, and with the exception of the Doncaster trains, these are very heavy trains."

The best expresses to and from Doncaster were even then excellent, and were timed as follows:—

Miles.		arr.	dep.	Speed m.p.h.
—	Liverpool Street ...	—	4.32	
55¾	Cambridge	5.47	5 50	44¾
70¼	Ely	6.10	6.12	44¼
85¾	March	6.33	6.37	44½
105½	Spalding	7.2	7.4	46¼
123¾	Sleaford	7.28	7.30	46¼
145¼	Lincoln	8.0	8.2	46
160¾	Gainsborough	8.22	8.23	46½
182	Doncaster	8.48	—	51

It will be noticed that a running average of 50 miles per hour was attained over the last section of this journey, and this was exceptionally excellent, since at Gainsborough the train had to negotiate a very sharp reverse curve on running on to the Manchester, Sheffield and Lincolnshire (now Great Central) line to cross the Trent. At this point the joint line

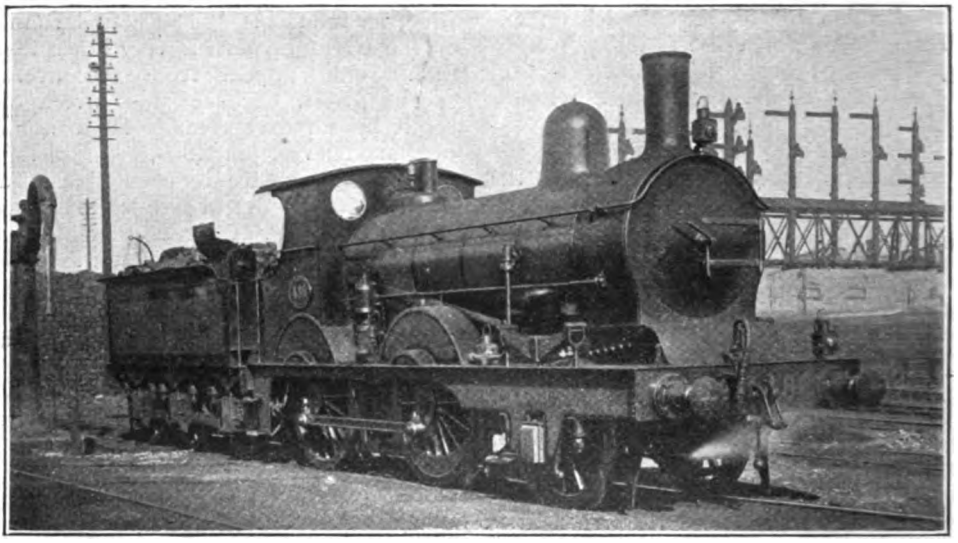


Photo] [*Locomotive Publishing Co., Ltd.*

2-2-2 EXPRESS LOCOMOTIVE, NO. 1002.

This type of engine was built at Stratford by Mr. James Holden, 1888-1893. Wheels, 7 ft.; cylinders, 18 in. by 24 in.

Digitized by Google



Photo] [*Locomotive Publishing Co., Ltd.*

STANDARD 2-4-0 PASSENGER ENGINE, NO. 486.

Series 417 to 506, 1250 to 1259, built at Stratford by Mr. James Holden, 1891-1902
Wheels, 5 ft. 8 in.; cylinders, 17½ in. by 24 in.

describes an S, and trains can only pass over the Trent Bridge curves at very slow speed. Moreover, at Lincoln allowance has to be made for a loss of 4 min. for slowing down to, stopping at and re-starting from the ticket platform. The up express, a seaside train from Yorkshire for Yarmouth, Lowestoft, and the East Coast, was timed as under :—

Miles.		arr.	dep.	Speed m.p.h.
—	Doncaster	—	10.55	
21¼	Gainsborough... ...	11.22	11.23	47
36¾	Lincoln (tickets) ...	11.44	11.47	48
75	Spalding	12.34	12.36	49
94½	March	1.1	1.4	46¾
110	Ely	1.25	1.32	44½
111¼	Ely Junc. (reverse)...	1.35	1.41	46
162¾	Trowse	2.48	—	

When the joint line was first opened the whole of the locomotives were considered as part of the Peterborough district, including those at Doncaster itself. But early in the "'nineties" the traffic had increased very much, and the Great Eastern trains were extended to York, when Doncaster became an independent locomotive district. As, however, there were no repairing shops at Doncaster, the passenger engines had to be sent for that purpose to Cambridge and the goods engines to Peterboro'.

Matters at Lincoln were somewhat complicated by the brake question. There is much interchange of traffic at this important railway centre, and since the Great Eastern has the Westinghouse, whilst the other companies at Lincoln have the automatic vacuum, the Great Eastern fitted two of the 2-4-0 engines, 713 and 746 (710 class), with vacuum brake for working through stock and sent them to Lincoln. Similarly to-day the Great Central maintains four express engines at Lincoln provided with the Westinghouse to suit the feelings of its Great Eastern friends.

I have already mentioned that the express service over the "joint" was chiefly worked by the 7 ft. singles, 770 to 780 and 1000 to 1003, stabled at Doncaster and Cambridge. But it was found more convenient to change engines at Ely, and 1001 and 1003 were sent to that station, after which Cambridge engines proper ceased working over this line. The Ely engines ran through to York and back daily. The other 7 ft. singles of this class, viz., 1004 to 1006 at Norwich and 1007 to 1009 at Parkeston Quay, also ran through to York on alternate days with the Harwich and York Continental expresses. But in 1896, when the Cromer

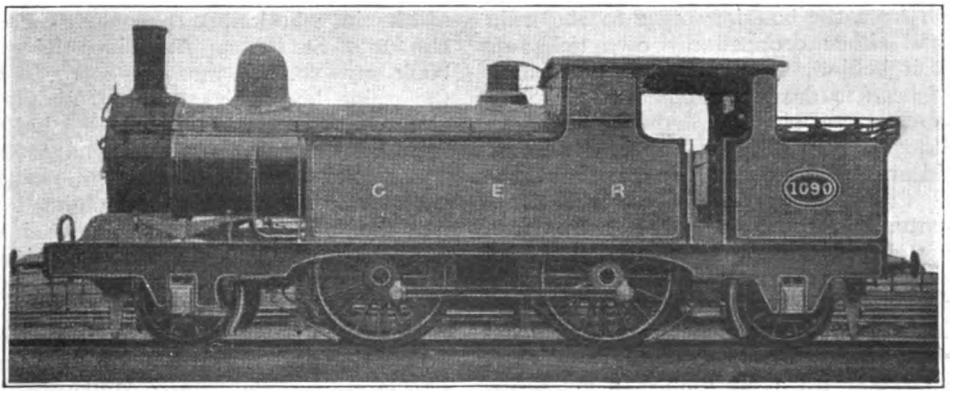
Digitized by Google

expresses required the services of these six "singles," they were taken off the York trains and replaced by 2-4-0 engines.

I regret to say that the 21 engines of this class had a very short but merry life on the Great Eastern. They were very good engines, but Nos. 1000 to 1009 were broken up in 1901 to 1904 after a brief existence of some eight to 11 years only. Nos. 770 to 780 having been reboilered lasted until 1904 to 1906, when they also disappeared. They did excellent work, and it seems a great pity that they were broken up in the prime of life. On the "joint line," at all events, they could show the coupled engines a "clean pair of heels."

The "joint line" has frequently been referred to as "The Cathedral Route." It passes through Ely and Lincoln, at March has Peterboro' within a few miles of it, and now, by the courtesy of the North Eastern, its trains terminate at York.

In previous articles on other railways I have remarked upon the subtle connection that appears to exist between the antiquities of ecclesiastical and railway scenery in cathedral cities. Those on the Great Eastern are no exception to the rule, for as choice architectural antiques some of the engine sheds belonging to this company at these places can give the cathedrals a long start and a bad beating. The Great Eastern engine shed has distinctive points of its own, and the ultra gloomy interior of one of these edifices with its extremely dim religious light would be hard to beat. One of these sheds, where some 70 or 80 engines are quartered, has accommodation for about a dozen, so that the balance have to be put to grass outside. One afternoon, during a period when I was investigating the cities of the cathedral route, with their glories, I became somewhat obsessed by the plethora of old stone saints with damaged countenances, and decided to look up the Great Eastern locomotive shed in the city for a change. I became so thoroughly interested not only in the locomotives themselves, but also in the archæological marvels of the depôt, that I forgot the time, and suddenly discovered, to my consternation, that my train was almost due to start. I ran to the station, made a hasty call at the ticket window, and bolted across the platform just in time to enter a first-class compartment (with a third-class ticket), this being the most handy. The train, which was very full, was moving out as I bundled into the carriage, where I suddenly found myself in the midst of the odour of sanctity, to wit—one archdeacon, one rural dean, a brace of vicars, and an extremely solemn curate. It appeared that his Lordship the Bishop of the diocese had been holding some sort of an eccleciastical symposium, and these were some of the remains on the way home. The solemn curate, however, it turned out, was an



2-4-2 TANK ENGINE, NO. 1090.

Series 1040-1049, 1060-1099, built at Stratford by Mr. James Holden, 1893-1902.
Wheels, 5 ft. 8 in.; cylinders, 17½ in. by 24 in.

Digitized by Google

"outsider," an unconventional accident with no part in the matter, and was, in fact, a stranger from another diocese. The rest of the company were exceedingly cheerful, and much genial harmony prevailed until the train stopped at a station where some of the itinerant ticket-collecting fraternity, known as "ticket snappers," were drawn up. In response to an appeal by one of these officials, the archdeacon, with a wistful and far-away look in his eyes, slowly and reverently drew forth a third-class ticket, remarking at the same time that there was no room in the lower class. The collector, possibly a descendant of one of Cromwell's Ironsides, carefully inspected the ticket, made a minute examination of the date, and saluting the company with a comprehensive sniff, went off to interview the guard. On returning he reported that if they had looked more thoroughly for it, they would have discovered third-class accommodation in the front coach. Therefore, he must reluctantly trouble the venerable gentleman for the excess fare, which, after considerable and really legitimate expostulation, was duly paid. In similar manner the soulless highwayman relieved the rural dean and both vicars of a portion of the contents of their purses. But when the curate's turn came, the latter triumphantly produced a first-class ticket to the ill-concealed astonishment of the Ironside collector, who was obviously bent upon extracting his full pound of ecclesiastical flesh. My inward enjoyment of the scene was, however, suddenly extinguished on discovering that in my rush from the booking office to the train I had either dropped my own ticket or left it behind, for after diligent search had been made, I could find no ticket of any class to show. I meekly had to follow the footsteps of the Church, and paid an unwilling tithe—in my case the full first-class fare. When the train eventually proceeded, the archdeacon rivetted his gaze upon a photograph of one of the cathedrals which adorned the opposite wall, and ruminated in stony silence, and the rural dean, probably encouraged by the absence of my ticket, remarked with a sly glance in my direction that there were evidently degrees in sin, whilst the solemn curate from another diocese silently exhaled an atmosphere of such unctuous rectitude that it seemed to rise from him like a cloud of steam from a hot wet blanket. Cathedral routes are very interesting—in the absence of the "ticket snapper."

Of the principal stations on the Cathedral route north of March, most of them belong to the Great Northern, and were in existence before the Great Eastern had anything to do with them. Lincoln and its level crossings I have mentioned in a previous article dealing with the Manchester, Sheffield and Lincolnshire Railway. Gainsborough is a quaint loft situated at the top of a ladder, and a very long way from Gainsborough town, for it stands in the open country. But from its narrow, inconvenient platforms one obtains a magnificent view across the valley of the Trent, and a Great Eastern express from the north carefully feeling its way round the S curve and over the Great Central bridge is one of the most picturesque railway scenes that I know. Of the Great Eastern stations proper, March has been entirely rebuilt from the old station which I remember in the "'eighties," and is now an excellent and commodious station with several platforms. Ely also has been much improved. To Cambridge I have already devoted some remarks. There remains Peterborough, which, although not actually on the main line, is a celebrated cathedral city situated at the end of a spur 14 miles from March, and is, moreover, a railway centre of the first importance.

The guide book says that Peterborough was founded in A.D 655 by a certain king of Mercia, who built a monastery there in honour of St. Peter. And since the guide book says so, this must be correct. But the guide book says nothing about the Great Eastern station, which, judging from its appearance, must have been there some time before the king turned up. From the outside the building looks like the relic of a Greek temple; inside the wayfarer finds two narrow, inconvenient platforms (one being an island), an assorted lot of pillars, a number of porters' barrows, and the main platform occupied by an empty London and North Western or sometimes a Midland train, sprawling the full length of that part of the station which is covered by a roof. These two railways act the part of the cuckoo at Peterborough, and do not give

Digitized by Google

the Great Eastern bird much chance of seeing the interior of its own nest. The Great Eastern train by which the traveller wishes to depart stands patiently outside in the rain some distance away. Finally, there is such a generally dingy appearance that one gathers the impression that the station has not been touched up or renovated since the visit of the King of Mercia aforesaid. I have not seen the station for the last four years, prior to which I was frequently there, but if it has been either burnt down or painted up in the meantime, I offer an apology to the company. But the Great Eastern can certainly claim to have been—as the old Eastern Counties Railway—the pioneer of railway enterprise at Peterboro'. The London and North Western put in an appearance there at the Eastern Counties station in June, 1845, and was followed by the Midland in 1846, and since part of the Midland line was not then opened throughout, the engines of the Eastern Counties for a time worked the portion of the Midland between Peterboro' and Stamford, until the completion of the Melton-Stamford section some 18 months later. The Great Northern, to which the uninstructed traveller considers that Peterboro' belongs, is in reality an interloper of a later date.

This reminds me that Peterboro' offers the traveller the refreshing experience of the cheapest railway journey in the kingdom—in fact, he can travel for nothing, and the usually lynx-eyed ticket collector will say nothing about it. The railway between Peterboro' (G.N.) and Peterboro' (G.E.) belongs to the Midland for the greater part of its length as far as Nene Junction signal-box, and thence I believe it is Great Eastern property. The fare by Midland or Great Eastern train is 1d., but the Great Northern indulges in the luxury of a few trains between the two stations, by which there is nothing to pay. The explanation as given to me some years ago at Peterboro', when I first sampled one of these cheap journeys, was that if the Great Northern charged 1d. fare, the Midland would promptly annex the amount, and so rather than trouble to collect pennies for a rival company, the Great Northern, which runs these occasional trains for the benefit of passengers from its own line who wish to proceed further by the Great Eastern, does the job for nothing. On the Midland line between Holbeck and Leeds, where a somewhat similar state of affairs exists, and the North Eastern runs over the former company's line, they are not so accommodating, for the traveller pays 2d. for a ¾-mile journey by a North Eastern train, of which amount the Midland takes 1d. But then nobody ever travels by train between Holbeck and Leeds in these days; the trams settled that matter.

As far as the Great Eastern is concerned, perhaps the most important item is the through coal traffic. The Midland keeps some 50 engines at Peterboro' for these coal trains from Nottinghamshire, Derbyshire, and Yorkshire, and practically the whole of this traffic is handed over to the Great Eastern, which in its turn maintains an army of coal engines there for that purpose. I believe the majority of the Great Eastern passenger engines in this district are stabled at March. Previous to the "'nineties" the March engines did not often run south of Ely, but when Peterboro' engines ceased to run through to London, their trains were worked by a March engine. In addition, they also work to Lincoln and Lynn, and in the summer with excursions from the joint line to Yarmouth and Lowestoft. For many years a Peterboro' passenger engine worked one train daily to London and back, but the hours proved somewhat long for the men, and now they do not usually go beyond Ely.

The usual type of passenger engines to be seen in this district are the 2-4-0 mixed traffics of the 417 class. These engines were built at Stratford from 1891 onwards, and by the end of 1896 there were no less than 90 in service, to which ten more were added in 1902. They have 5 ft. 8 in. coupled wheels, 17½ in. by 24 in. cylinders (though some are 17 in. only), and 140 lb. pressure, with the exception of the last 20, which have 160 lb. They are extremely useful and handy engines, and specially suitable for the long branches and cross-country lines of the Great Eastern. As might be expected from their number, they are to be found all over the system. Though a few of them have undergone some changes of station, they have in general

Digitized by Google

been distributed in the following districts :—

Stratford.—417 to 425.
pswich.—467 to 476, 505 and 506, and previously 465 and 466, and afterwards 465.
Norwich.—439 to 452, 487 to 496.
Lynn.—477 to 482.
Cambridge,—453 to 464, 501 to 504, and afterwards 466.
Peterborough and March.—426 to 438, 483, 484, 499 to 501.
Doncaster.—485, 486.

The last 10, Nos. 1250 to 1259, which appeared only in 1902, have always been at Stratford. The Stratford engines were partly quartered at Southend, Witham and Braintree. The Ipswich engines were frequently on main line work, and ran to Norwich and London, whilst some were located at Colchester and worked to London. The Norwich engines performed branch work almost exclusively, and also worked fish trains to Peterboro'. Of them Nos. 439 to 442 were at Cromer, 445 at Beccles, and 488-9 at Yarmouth (Vauxhall). 452, also at Yarmouth, together with 451 at Lowestoft, were vacuum fitted, and used as pilots for foreign excursions and fish trains. On the occasion of the annual "goose fair" at Nottingham 488 ran the excursion through from Yarmouth to Nottingham for some years. March engines ran to London on the one hand, and Lincoln on the other. The Lynn engines were almost entirely on local work, but worked, in addition, the 1.0 p.m. fast train from Ely to Peterboro'. The two Doncaster engines were usually employed on fish trains and excursions, with which they frequently went through as far as Yarmouth in the summer.

The "main line" tank engines, Nos. 1060 to 1099, built in 1893-1895, to which 10 more, 1040 to 1049, were added in 1902, are in reality the above 417 class, with an additional trailing axle and the substitution of side tanks in place of tenders. They are of somewhat unusual design, in that, although they are of the 2-4-2 type, they are not fitted with radial axleboxes. These engines are used principally on the long distance local services out of London to Southend, Bishop's Stortford, Witham, &c. Some were fitted with condensing apparatus.

The Great Eastern goods engines do not require special mention. The useful standard 610 class, designed by Mr. Worsdell in 1882, is still in use, and engines of this class have been constructed as late as 1912, although, of course, they have been supplemented by a heavier type—the 1150 class—for coal trains. But there was one variant of the 610 class that had some uncertain traits. These engines, built in 1892 to 1898, and numbered between 949 and 999, with some others, had the same general dimensions as the 610 class, viz., 4 ft. 11 in. wheels and 17½ in. by 24 in. cylinders, but the latter were of a different design. Unlike the 610 class, which had the steam chests and valves between the two cylinders, the 999 class had them below the cylinders. After they had been at work a few years I was told that there was some difficulty in getting them to steam freely, and it was stated that the position of the steam chests appeared to affect the supply of air to the front dampers of the ashpans. Anyway, whatever the reasons, the 999 class have not been perpetuated since 1898, and a number of them have since been broken up. This shows that there are many contributory causes which may make or mar a locomotive.

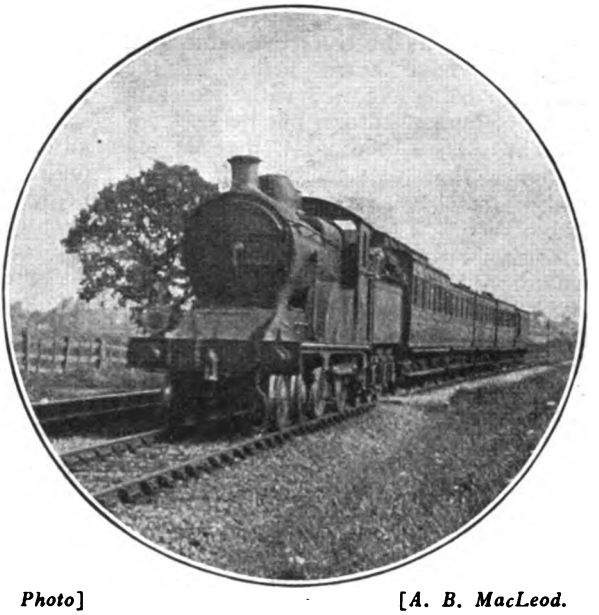
A correspondent has drawn attention and takes exception to my statement on page 156 of the September issue that the G.E.R. was the first line to introduce "the modern 0-4-4 side tank passenger engine," and he instances the 0-4-4 tank engine No. 231 of the "Brighton" Railway, and the similar engines of the South Eastern Railway which came out in 1866. He omitted, but might have added, the 26 Midland 0-4-4 tank engines of 1869-70. Nevertheless, my statement was perfectly correct. All the above engines differed from the modern 0-4-4 side tank engines in two very important particulars. In the first place, these older engines had double frames and outside cranks, and differed in this respect very materially from the modern 0-4-4 inside framed engine used on so many lines. Further, I used the expression "side tanks," but the engines he mentions, and also the Midland engines referred to above, had *back* tanks and not side tanks at all. They are far removed from the definition which my expression was intended to convey.

(To be continued.)

Digitized by Google

British Locomotive Practice and Performance.

By CECIL J. ALLEN



Photo] [*A. B. MacLeod.*

GREAT EASTERN RAILWAY.

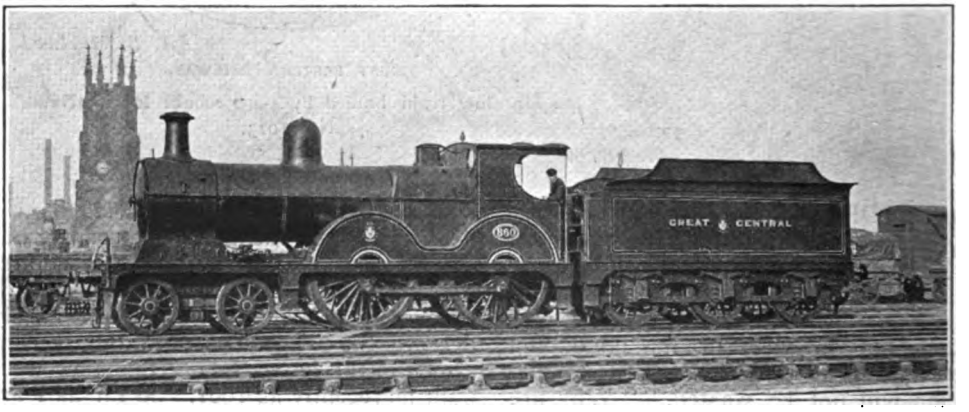
Up slow train hauled by 4-4-0 rebuilt locomotive, No. 1013.

A CORRESPONDENT at Great Missenden raises a question which may be exercising the minds of others than himself; the matter has been dealt with previously, but in view of its undoubted interest, a little time devoted to its discussion will not be wasted. "Why are some of our railways so fond of building big engines?" my friend enquires. "Take the Great Central and their magnificent *Sir Sam Fay* 4-6-0 type or the latest 4-cylinder 4-6-0 *Lord Faringdon*. Speaking generally, none of the G.C.R. trains south of Nottingham exceed six coaches, although when traffic is exceptional there are occasionally eight. On these trains I have seen almost every kind of express passenger engine they possess keeping good time. On the 3.15 p.m. Manchester express from Marylebone, for example, the usual load is six coaches and the engine an outside-cylinder 'Atlantic.' Yet I have seen on this train one of the oldest engines they possess—I don't know the class, but they are inside-cylinder engines without superheater—and the driver kept good time to Sheffield, arriving only 1 min. late after being badly slacked at Woodford and Rugby." The writer's locomotive descriptions are inclined to be scanty, but one may assume that he refers to the first 4-4-0 engines of Mr. Robinson's design, numbered in the 1000's, which hardly deserve the allegations of antiquity contained in the letter, seeing that they were built as recently as 1901. So far as I am aware, none of the earlier Pollitt 4-4-0's work south of Nottingham, but the Robinson engines referred to are frequently seen on the London section, generally on slow trains or as pilots to expresses.

"To-day," continues the letter, "I saw another of these old engines doing good work. She was running (from Leicester) on the 8.20 a.m. *ex*-London Road to Marylebone, with a load of five 60-ft. coaches, equal, I suppose, to about 230 tons all told." This is, I fear, a serious over-estimate, as the tare load would in these circumstances be about 175 tons, and the gross load could not be much over 190 tons, even if the train were packed to its fullest capacity. "She passed Missenden Station at something over 74 miles per hour, taking 4 min. 40 sec. from there to Amersham. Then another day one sees *Lord Faringdon*

Digitized by Google

gently smiling as he trots the same load along." I have heard before of the locomotive being credited with a certain amount of human nature, but I must confess that this is the first time in my experience that the exercise of risible faculties has been included amongst its capabilities! "I should like to know," my correspondent proceeds, "why there should be this excess of engine power and unnecessary consumption of fuel. I quite agree that *Sir Sam Fay* and *Lord Faringdon* are lovely machines, but I am far from being convinced of the need for 120-ton engines, with the necessarily increased costs of maintenance. Even the Metropolitan Railway has now caught the fever, with their new 0-6-4 tanks; they take just the same loads and keep



Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY.

Pollitt 4-4-0 locomotive, No. 860, rebuilt by Mr. Robinson with superheater, extended smokebox and canopy cab.

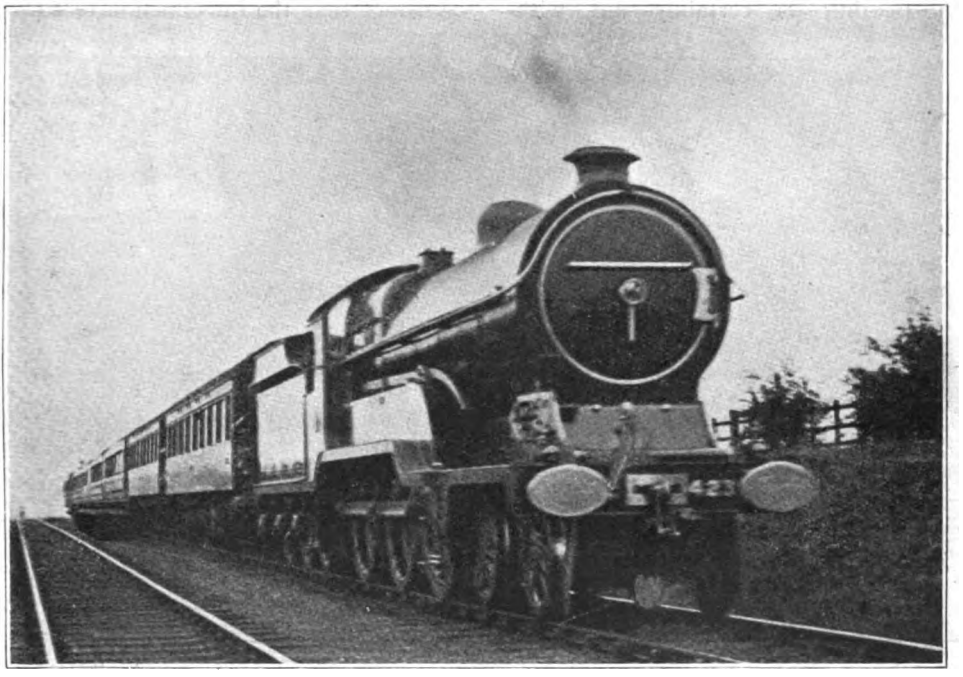
the same times as their smaller 0-4-4 sisters, with which they take regular turns in service. The bigger types can certainly start up in a wonderful manner, but I have known her 0-4-4 rival equal her time after some 5 miles. Why such apparent waste?"

A little knowledge is admittedly a dangerous thing. My correspondent is not altogether correct in his facts, and the omission of various material considerations from his argument leads him to faulty conclusions. Let us examine the question, first as concerns the Great Central Railway, and then in its wider aspect as relating to the growing use of large and powerful locomotives. In any proper estimation of locomotive work three main considerations must be borne in mind: First, load; second, grading, and third, scheduled speed. My friend has drawn all his deductions from observations made under the first of these heads, entirely neglecting the other two. As has frequently been pointed out in these columns, the G.C.R. has the hardest of all the main lines running out from London so far as grading is concerned. The total vertical rise for the first 100 miles from London *via* Aylesbury is 1,370 ft., comparing with 1,250 ft. on the Midland Railway, 1,080 ft. on the G.E.R. Norwich route (*via* Ipswich), 970 ft. on the G.N.R., 930 ft. on the L. and S.W. West of England main line, 650 ft. on the L. and N.W.R., and 290 ft. on the G.W.R. Bath and Bristol main line. Against a total rise of 2,140 ft. to Sheffield the Midland figure is 1,810 ft., while to Manchester the G.C. 2,900 ft. compares with 2,250 ft. on the Midland route, and 1,050 ft. on that of the L. and N.W.R.

Yet over such a course as the G.C.R. there both were before the war, and still are, scheduled the fastest collection of point-to-point booking in these islands. Obviously with loads of the magnitude obtaining on such lines, say, as the London and North-Western or Great Northern, the maintenance of such times would be impossible, even by the most modern of locomotives. A rough calcu-

Digitized by Google

lation on the basis of vertical rise over the first 100 miles from London shows a standard G.C. train of six 60-ft. coaches, weighing full about 225 tons, to be equal in point of haulage to 240, 265, 285, 295, 370 and 505 tons respectively on the initial 100 miles of the other six routes mentioned, at the same scheduled average speed, apart from service slacks, frequent curves, or other hindrances. These are only very approximate figures, but they afford some idea of the difficulties of the Great Central route. North of Nottingham, of course, the gradients become goes. A six-coach standard restaurant car train may be considered to have an average weight, with passengers and baggage, of 225 tons, and a five-coach train of 185-190 tons. Yet on my two last runs on the 12.15 p.m. *ex*-Marylebone we have taken 330 and 255 tons from the terminus, 330 and 275 from Woodford, 340 and 310 from Leicester, and still further additions, which I did not note, from Nottingham. On a series of runs with the 7.0 p.m. into Marylebone the gross loads have been 235, 330, 275 and 310 tons respectively, and I have



Photo] [*F. H. Gillford.*

GREAT CENTRAL RAILWAY.

12.15 p.m. Marylebone to Manchester express near Bulwell Common.
4-6-0 locomotive, No. 423, *Sir Sam Fay.*

still longer and far more severe, and it is over the latter section that the large 4-6-0 engines are used principally, although obviously the times between Nottingham and Manchester are not so tight as those on the London Extension.

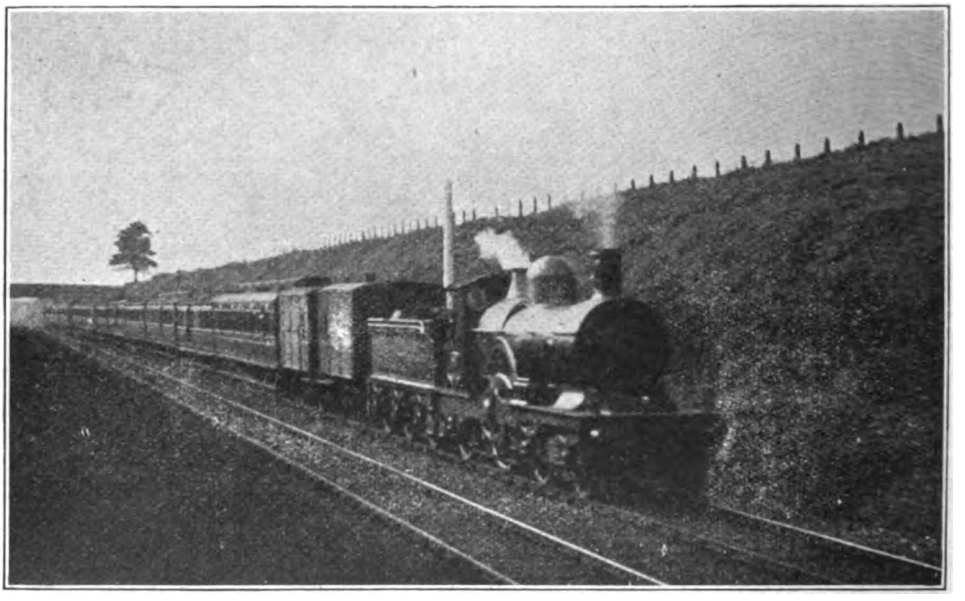
So much by way of preliminary to the reply proper: now for my correspondent's facts. I am rather disposed to quarrel with his estimate of average G.C. trainloads, as my experience does not tally with his so far as recent experience since heard, from an absolutely authoritative source, of this train loading on two occasions to 421 and 429 tons empty, equivalent to at least 440 and 450 tons full. The 3.0 p.m. arrival from Bradford and the 3.15 p.m. to Manchester I have often seen heavily loaded (although I must confess that my experience relates chiefly to week-ends), and I believe the 6.10 p.m. down also carries some substantial loads.

Away back in 1912, *apropos* of the

Digitized by Google

12.15 p.m. down, I found that I wrote of a locomotive of the type referred to by my friend as "one of the oldest engines" on the G.C. system: "the load of 220 tons on such smart bookings was rather beyond the powers of the 4-4-0 engine (No. 1023) by which we were hauled." To-day the 300-ton trains now not infrequently met with on G.C. metals are esteemed by the authorities to be beyond the powers of the much larger "Director" class 4-4-0's and the "Atlantics," and piloting is resorted to in practically all cases in which the load exceeds eight of the large bogie vehicles. Such piloting is certainly not without reason, on the showing of the comparative figures given in the last paragraph. Here, therefore, we have evident and ample justification for the introduction of still heavier and more powerful express locomotives. If a class of 4-cylinder 4-6-0's working on the London Extension should enable such piloting to be dispensed with, halving the cost of enginemen's time, and reducing fuel consumption and wear and tear at least proportionately to the reduction in total engine and tender weight, the locomotives would be a profitable investment. Such a result is already in course of achievement on the Northern section of the line, as a run, described later, behind *Lord Faringdon* himself over the terribly difficult Manchester-Sheffield section, with no less than 330 tons behind the tender, fully demonstrates.

And now, finally, as to my friend's deductions. It is a fatal mistake to estimate the cost of working and maintaining a locomotive from its size alone, *i.e.*, to assume that a larger engine must of necessity cost more to fuel and to maintain than a smaller engine. I know for a fact that the introduction of 64-ton 4-6-0 engines on the heavy summer train services of a certain company, whose 51-ton 4-4-0's had previously been hard put to it at times to maintain their schedules, actually resulted in a *reduction* in average coal consumption on the trains concerned, while I have it from track inspectors on the railway in question that the six-coupled engines were easier on the permanent way, owing to their successful balancing arrangements, than practically any previous express locomotive type. It may be granted that the 4-6-0 engines



Photo] [*F. S. Watson.*

GREAT WESTERN RAILWAY.

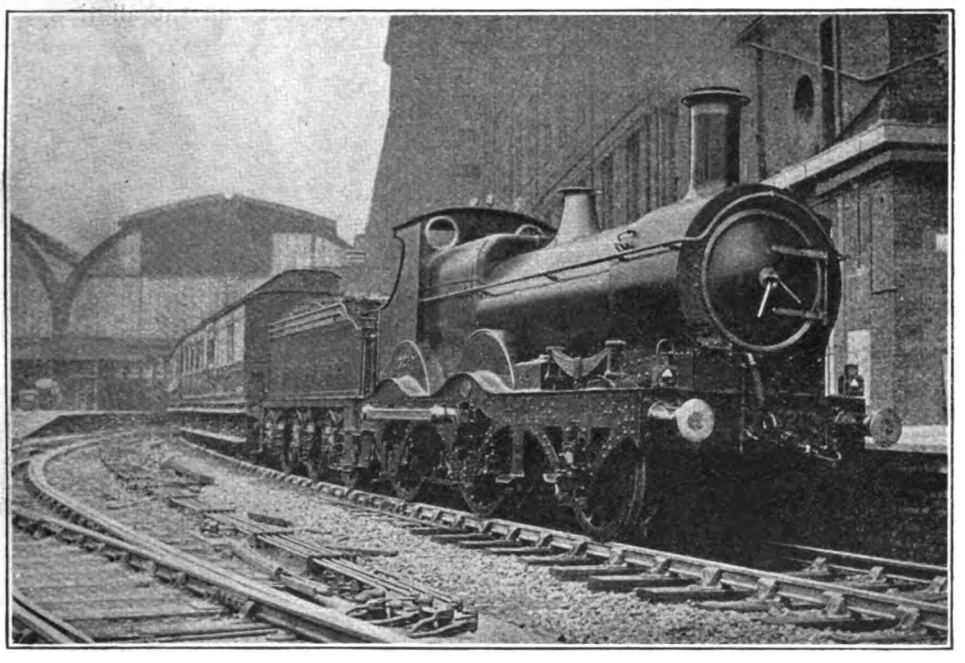
Dean 7 ft. 8 in. single on heavy up West of England express ascending Flax Bourton bank (between Bridgwater and Bristol).

Digitized by Google

were superheated and the 4-4-0 engines were not, but that alone is not sufficient explanation. The real explanation is that the 4-4-0 engines were, on the heaviest expresses, always within measurable distance of being thrashed in order to keep time, and under adverse weather conditions certainly were so, whereas the 4-6-0 engines were worked well within the limits of their capacity. Thrashing a small engine inevitably results in waste of fuel, much of the heat of which is drawn through the short boiler and thrown out of the chimney when an undue amount of coal is being burned, while the wear and tear of the machine is disproportionately increased.

Conversely, it is possible economically to drive a large engine on a light train, in which circumstances fuel may be added to the fire in smaller quantities, and is assured of complete consumption of a fire-grate of ample area, while a maximum of its calorific value is absorbed in tubes of ample length. Against this we must set the greater constructional cost of the heavier engine, and the enhanced consumption of power in moving its increased weight: track maintenance, as we have seen, need not be materially affected provided that the balancing of the engine and its general distribution of weight are reasonably good. The ideal arrangement, of course, would be to proportion the size and power of the engine employed to the weight of each train hauled, but such a procedure is, of course, rendered more or less impracticable by considerations of the working time of the crews, and the necessity of returning each engine to its shed by the first available means. In so far as the ideal is unattainable, therefore, the most satisfactory method is to legislate for extremes, and to design and build engines capable of meeting the maximum—or the "average maximum," if so contradictory a term be allowable—traffic demands of the railway concerned. In this way thrashing, on the one hand, or piloting on the other—both expensive expedients—may be avoided, and ultimate economy is in all probability affected.

At the same time, it cannot be dis-



Photo] [*H. C. Doyne.*

GREAT WESTERN RAILWAY.

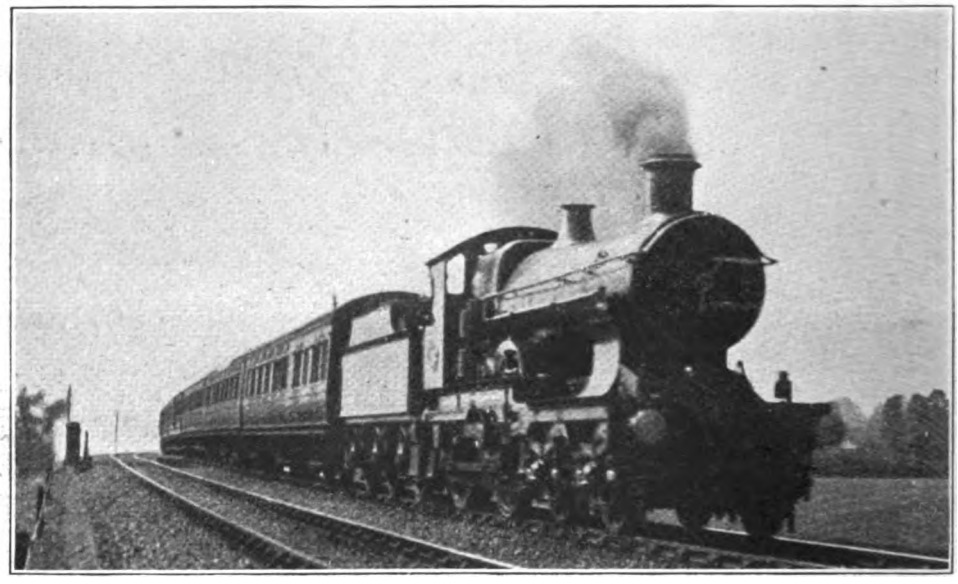
Through train, Paddington to Southampton, *via* Didcot, Newbury and Southampton line. Rebuilt 2-4-0 engine, No. 3217

Digitized by Google

puted that the work put up by some of our smaller engines when circumstances so require is nothing short of marvellous. It is worthy of note that no less than eleven out of the remarkable collection of eighteen runs tabulated in the last issue were made behind 4-4-0 engines—that peculiarly British locomotive type which the late Mr. Rous-Marten once so aptly described as the "maid-of-all-work" in these islands. And on most of the lines on which the best runs described were behind larger engines of the 4-4-2 and 4-6-0 types, I could without difficulty have found 4-4-0 runs very nearly matching them in excellence. For example, on the Great Northern Railway what could be finer than the exploit of No. 41, on the 2.20 p.m. down "Scotsman" *ex*-King's Cross, which, with 425 tons, or no less than nine times her own modest weight, covered the 82.7 miles from Grantham to York in a shade under the 97 min. scheduled? Or could anyone who knows the real difficulties of the Great Eastern main line conceive a more notable feat than that of No. 1809 in hauling a 14-coach "Norfolk Coast Express" of 400 tons—7.7 times her own weight—from North Walsham to London in 157½ min., or 1½ min. under the 159 min. allowed? Again, on the Great Western Railway, was not the highest authenticated speed ever attained by a steam locomotive in this country achieved by the 4-4-0 engine *City of Truro,* in the descent of Wellington bank with an up special mail express, when the fabulous rate of 102.3 m.p.h.—recorded by a most competent observer—was attained?

Very similar things might be written concerning veteran 4-2-2 and 2-4-0 types, many of which are still doing honourable service, and which can even yet rise to the occasion, in no uncertain manner, when special effort is required. But the maintenance of such an effort day in and day out, at all times, is a very different matter, and the consistent use of insufficiently-powered engines—whatever their maximum capabilities may be on special occasions—is bound to result in excessive consumption of fuel, inflated maintenance costs and curtailed life. It is precisely in this respect that the margin of power embodied in the large modern express locomotive types in use leads to, or tends in the direction of, ultimate economy.

In dealing with performance, I have first to describe the run behind the new Great Central 4-cylinder 4-6-0 No. 1169, *Lord*



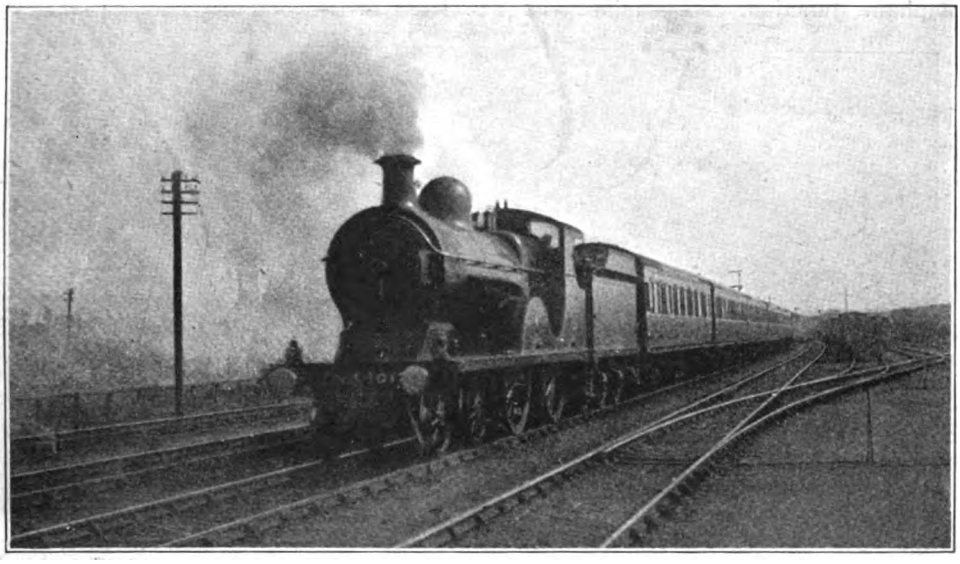
Photo] [*E. D. Ashton.*

GREAT WESTERN RAILWAY.

Worcester-Paddington express, hauled by "Flower" class 4-4-0 engine.

Digitized by Google

Faringdon, to which I have previously referred. The details reach me from a Sheffield friend who has made a special study of G.C.R. locomotive working over the mountainous section between Sheffield and Manchester. On this occasion the 8.20 a.m. *ex*-London Road was made up to no less than eight of the 60-ft. 8-wheelers, together with a clerestory 8-wheeler, totalling 304 tons in tare weight, and fully 330 tons with passengers, as the train was very crowded. A "Director" or an "Atlantic" would certainly have been piloted in these circumstances, but *Lord Faringdon* made light of the train, blowing off slightly throughout the ascent to Woodhead. The conditional stop at Mottram, 4.8 miles from Guide Bridge, was made in 9 min. 38 sec., despite the intervening and continuous rise at 1 in 151-108-97-185-143 for the first 4 miles. From Mottram the start to Dinting is up at 1 in 122 for 1¾ miles, with a subsequent level stretch over the viaduct, but *Lord Faringdon* passed the latter station, 2.1 miles, in 4 min. 45 sec., and covered the subsequent 7.3 miles to Woodhead, first at 1 in 100 for 2⅜ miles, and then at 1 in 117 for 5 miles, in 12 min. 4 sec. The 3.2 miles through the tunnel to Dunford Bridge, at 1 in 201, occupied 5 min. 51 sec., the engine being evidently eased here somewhat materially, as the average rate dropped from 36.3 to 32.8 m.p.h. From Dunford down to Penistone the remaining 6 miles, under easy steam, took 7¼ min., making a total of 29 min. 55 sec. from Mottram, 18.6 miles, or, inclusive of 41 sec. standing at Mottram, 40 min. 14 sec. from Guide Bridge. Schedule for this distance, stop included, is 40 min. The 12.9 miles on to Sheffield were covered, with several slacks, in 16 min. 12 sec., instead of the 17 min. allowed. So altogether *Lord Faringdon* acquitted himself quite creditably, with a load which, for this road, it was somewhat exceptional to see unpiloted.



Photo] [*A. Richardson.*

GREAT CENTRAL RAILWAY.

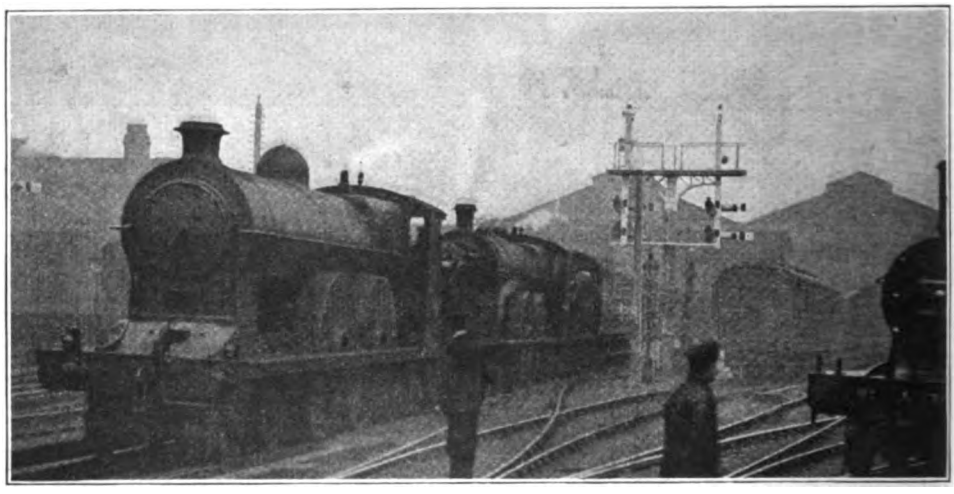
Through (pre-war) express from Bournemouth to Newcastle-on-Tyne near Oxford (G.W. Rly.). 4-4-0 locomotive, No. 1013.

By way of contrast, it may be well to use this opportune occasion for the description of a number of runs behind engines of very moderate size and power, which I have kept by me for some time with the object of using in illustration of a discussion such as has occupied the practice section of the present article. Most of these runs have been forwarded to me by a correspondent whose painstaking records have often found a place

Digitized by Google

in these columns. Let us first commence with some remarkably fine samples of the work of the Drummond 0-4-4 type tank engines on the London and South Western Railway. The trains concerned were non-stop from Brookwood or Woking to Vauxhall, and for engines with only 5 ft. 7 in. wheels the work was noteworthy, even though the grades are mainly favourable. No. 49 and No. 328, with 220 and 225 tons respectively, passed Byfleet, 2.7 miles from Woking, in 4 min. 36 and 33 sec.; Weybridge, 5.2 miles, in 7 min. 22 and 20 sec.; Surbiton, 12.3 miles, in 14 min. 46 and 41 sec.; Wimbledon, 17.1 miles, in 19 min. 46 and 40 sec.; Clapham Junction, 20.5 miles, in 23 min. 24 and 10 sec.; and reached Vauxhall, 23 miles, in 27 min. 16 sec. and 26 min. 45 sec., No. 328 thus making the faster finish. Schedule time on both runs was 30 min. On the 4 miles' falling start, mostly at 1 in 387, 57 m.p.h. was the rate attained in each case, with a fall to 55 on each trip at Oatlands (after 1¼ miles up at 1 in 330). Maxima at Esher were 63 and 64 m.p.h., while the minimum at m.p. 11¼ on both runs was 54, and the maxima at Earlsfield 60 and 61 m.p.h. respectively. The gradients concerned are all quite short and of trifling inclination. Consequently the respective average speeds on these runs works out at 50.2 and 51.6 m.p.h. start-to-stop, even over so short a total distance.

From Brookwood, with the favourable start increased by the addition of 3.7 miles at 314-326, No. 233, with 230 tons, passed Woking, 3.7 miles, in 5 min. 45 sec.; Weybridge, 8.9 miles, in 11 min. 3 sec.; Esher, 13.7 miles, in 15 min. 48 sec., and reached a special stop at Surbiton, 16 miles, in 18 min. 50 sec., representing an average start-to-stop speed of 51 m.p.h. Maxima at Brooklands and Esher were 63 and no less than 65 m.p.h., with an intervening minimum of 56 at Oatlands. On the last occasion No. 129, with 215 tons, passed Woking from Brookwood in 5 min. 34 sec.; Weybridge in 10 min. 49 sec.; Surbiton in 18 min. 2 sec.; Wimbledon, 20.8 miles, in 22 min. 56 sec.; Clapham Junction, 24.2 miles, in 26 min. 29 sec.; and reached Vauxhall, 26.7 miles, in 29 min. 54 sec. The schedule time of 32 min., which represents a speed fractionally in excess of 50 m.p.h., was thus improved on by over 2 min., the actual end-to-end average being 53.6 m.p.h. Maxima of 63 m.p.h. at both Brooklands and Esher and of 61 at Wimbledon were reached in this run, with a minimum of 55 at Oatlands and also at m.p. 11¼. That is to say, speed ranged consistently between 55 and 63 m.p.h. over 20 miles, the 20.5



Photo] [*F. E. Mackay.*

LANCASHIRE AND YORKSHIRE RAILWAY.

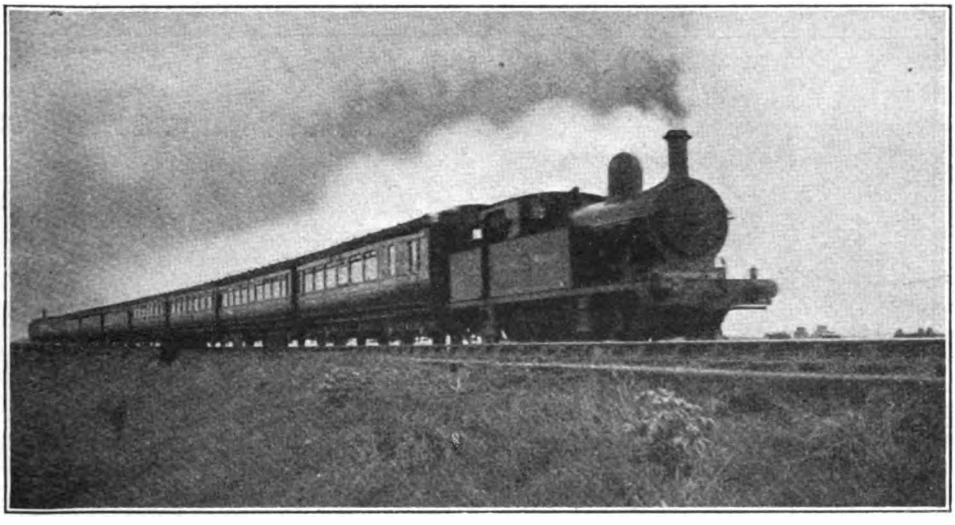
1.2 p.m. Liverpool express leaving Leeds. Engines Nos. 1395 and 1424, 4-4-2 type.

Digitized by Google

miles from Woking to Clapham Junction taking only 20 min. 55 sec. This was a great feat for the type of engine concerned.

While on the subject of tank locomotive performance, I might as well describe two recent journeys of my own by the Lancashire and Yorkshire Railway 11.0 a.m. express from Leeds to Manchester, on both of which we were horsed by a 2-4-2 type tank engine. The chief interest of these runs lies in the direct comparison between the work of a superheater—No. 637—and a non-superheater—No. 746—under almost identical conditions of loading. On the former occasion we left Holbeck with 100 tons, and Bowling Junction, and slacking again there, we reached Low Moor, 11.1 miles, in exactly 17 min., against 18 min. allowed. The non-superheater engine, also with 100 tons, fell a long way behind these times, not accelerating above 24 m.p.h. in the 1 in 50, and taking 4¼ min. to Armley, 9 min. 10 sec. to Stanningley, 13¼ min. to Laisterdyke, and 19 min. 5 sec. to Low Moor. Between Low Moor and Halifax on the first run we suffered slacks, being before time, but the non-superheater covered the 5.3 miles to a stop beyond Halifax Station (before setting back on to the Bradford portion) in 9 min. 5 sec.

From Halifax No. 637—the super-



Photo] [*E. Mason.*

LANCASHIRE AND YORKSHIRE RAILWAY.

Manchester to Southport express, composed of fireproof stock, passing Irlam's-o'-th'-Height. Tank locomotive. No. 746, 2-4-2 type.

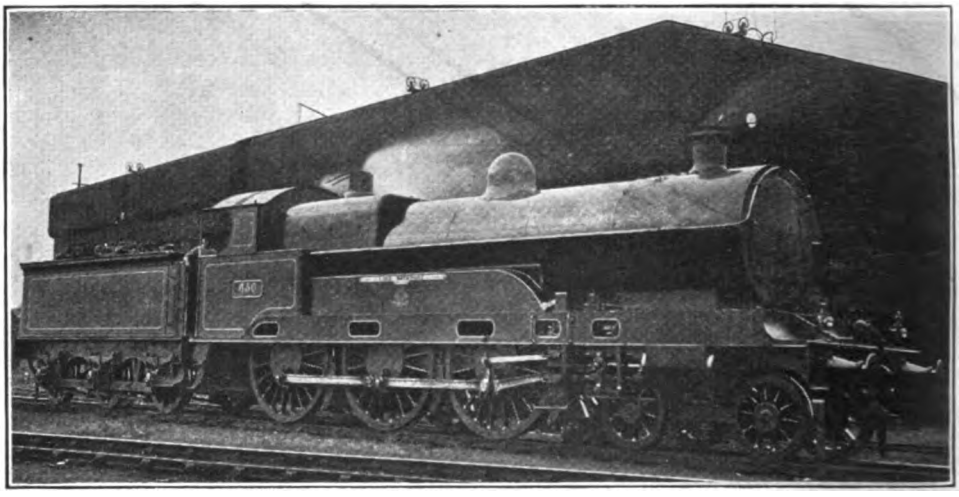
did exceedingly well up the 1⅛ miles at 1 in 50 to Armley, accelerating to 29 m.p.h., and on the succeeding 1⅞ miles at 1 in 128-150 to no less than 47 m.p.h., and maintaining that rate unvaryingly up the subsequent 3½ miles at 1 in 100. Consequently Armley, 1.5 miles from the start, was passed in 3 min. 35 sec.; Stanningley, 4.5 miles, in 7 min. 55 sec.; and Laisterdyke, where we slacked very carefully, 7.6 miles, in 11¼ min. This was a noteworthy figure, seeing that the vertical rise from the dead start is fully 360 ft. in this short distance. Running without steam down the incline to

heater engine—had a fairly substantial load of 205 tons, whereas No. 746 had only 180 tons; the work was now, however, very similar on both runs. Speed rose to 56½ and 54 m.p.h. on the 1 in 120 descent to Milner Royd Junction (in both cases taken very cautiously), and Sowerby Bridge, 3.6 miles from Halifax, was passed in 5 min. 35 sec. and 25 sec. The ensuing ascent of 5.1 miles to Hebden Bridge, averaging 1 in 300, occupied 6 min. 10 sec. and 20 sec., and the steeper 1 in 180 ascent of 4.3 miles thence to Todmorden stop (on which the minimum rate on each run was 46½ m.p.h.) took

Digitized by Google

6 min. 10 sec. and 6¼ min. respectively. This gave totals of 17 min. 55 sec. and 18 min. for the 13 miles from Halifax, allowed 19 min. Delays were experienced on each run through engineering operations in Summit tunnel, but the superheater engine attained 60 m.p.h. on the short 1 in 330 descent thence to Smithy Bridge, whereas the non-superheater did not get above 53: times from Todmorden (with 2 miles rising start at 1 in 180) to Rochdale, 8.7 miles, were 14¼ and 14¼ min., or 12½ and 13 min. net, against an allowance of 13 min. Almost throughout from Rochdale into Manchester No. 637 was badly delayed by signals, but No. 746 completed this intricate length in exactly the 15 min. dealt with, weighs only 50 tons in working order.

One of the most notable runs with a 2-4-2 type engine that has ever come under my notice was made by the friend to whom I have previously referred, on an up journey between Slough and Paddington, Great Western Railway. The engine concerned was No. 3611, and the load 150 tons. Starting very briskly, No. 3611 passed Langley, 2.3 miles, in 3 min. 42 sec.; West Drayton, 5.3 miles, in 6 min. 45 sec.; Southall, 9.4 miles, in 10 min. 32 sec.; Ealing, 12.8 miles, in 13 min. 30 sec.; and Westbourne Park, 17.2 miles, in 17 min. 32 sec.; reaching Paddington, 18.5 miles, in the astonishing time of 19 min. 40 sec. The 14.9



Photo] [*P. F. Cooke.*

LONDON AND NORTH WESTERN RAILWAY.

4-cylinder 4-6-0 locomotive, No. 650, *Lord Rathmore*, "Claughton" class.

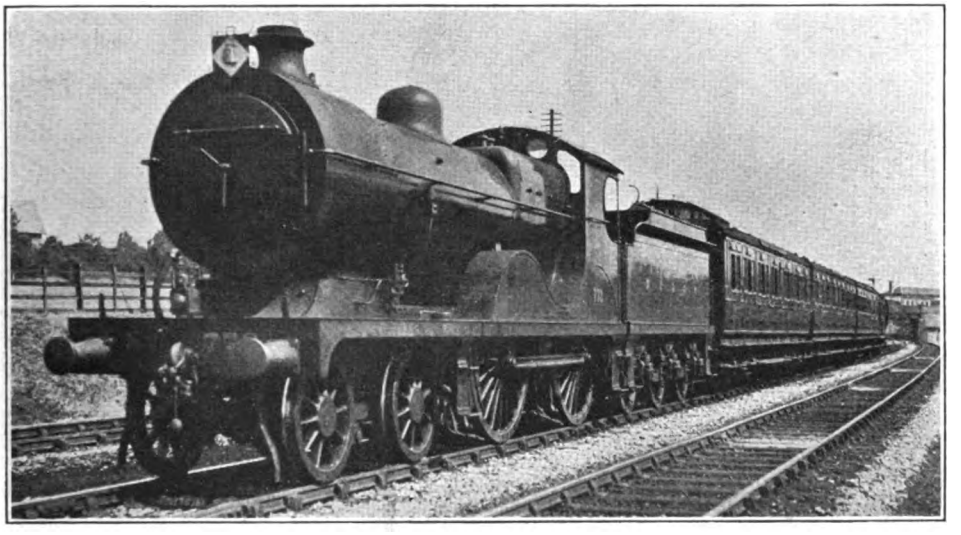
allowed. Here again was excellent work for tank engines: the superheater engine had time in hand throughout, and fully equalled the average performance of the tender "Atlantics" and heavy 4-cylinder 4-6-0 engines. It must be admitted, however, that the tank engines in question are large and powerful for the 2-4-2 arrangement of wheels, the superheater type having 20 in. by 26 in. cylinders, 5 ft. 8 in. driving wheels, and a total weight of as much as 66½ tons. Many companies would build a locomotive of such dimensions on ten wheels, instead of eight. By contrast, the L. and S.W. 0-4-4 type, whose work has just been miles from Langley to Westbourne Park were actually covered in 13 min. 50 sec., despite the fact that the engine concerned has only 5 ft. 2 in. wheels. As a pendant to this run No. 3565, one of the little 2-4-0 tanks, made some really wonderful running, with a very substantial load of 260 tons, on a down Windsor express. A bad slack was needed over the widening works at Westbourne Park, but No. 3565 was through Acton, 4.3 miles, in 7 min. 53 sec.; Southall, 9.1 miles, in 13 min. 41 sec.; West Drayton, 13.2 miles, in 18 min. 15 sec.; and Langley, 16.2 miles, in 21 min. 20 sec.; Slough was reached in 24 min. 13 sec., or 23¾

Digitized by Google

min. net. Schedule time for this train was 25 min. The 7.1 miles from Southall to Langley were covered in 7 min. 39 sec., speed rising finally to 54 m.p.h.

In comparison, three other runs with early types of tender engines over the same length of line are worth mention, in each case on a 24-min. schedule. Nos. 808 and 3233, both rebuilt 2-4-0 engines, and both hauling 150 tons, passed Westbourne Park, 1.3 miles, in 3 min. 6 sec. and 2 min. 35 sec. (the latter is quite a record time); Acton in 7 min. 16 sec. and 6 min. 37 sec.; Southall in 12 min. 35 sec. and 12 min. 26 sec. (No. 3233 having suffered a p.w. slack at Hanwell); West Drayton in 16 min. 48 sec. and 17 min. 5 sec.; and Slough was reached in 22 min. 40 sec. and 22 min. 54 sec. On each run the engines were eased after West Drayton, and the net time from London in the second instance was 21¾ min. No. 163, one of the famous 2-2-2 engines of the "Cobham" class, with 200 tons, passed Westbourne Park in 3 min. 20 sec.; Acton in 7 min. 21 sec.; Southall in 12 min. 35 sec.; West Drayton in 16 min. 44 sec.; and Langley in 19 min. 42 sec.—here the speed was sustained at 62 m.p.h.—reaching Slough in the smart time of 22 min. 19 sec. This last was a slip arrival time.

From these runs I pass to some specimens of the work of which the Dean 4-2-2 engines on the G.W.R. were capable when they were put to it. There are first three runs Taunton to Bristol—a practically level stretch of line, save for the rise to Flax Bourton, consisting of 1½ miles at 1 in 448, 2¾ at 1 in 340, and 1⅛ at 1 in 194. Then ensues a gentle descent to Bristol, which has to be approached with great caution, owing to the sharply curved character of the line. No. 3028 had the heavy train, for a single driver, of 330 tons, and yet contrived to pass Durston, 5.8 miles from Taunton, in 9 min. 15 sec., and Bridgwater, 11.6 miles, in 16 min. 11 sec., where the load was reduced, by the loss of a slip portion, to 280 tons. Subsequently Highbridge, 17.9 miles, was passed in 23 min. 15 sec.; Bleadon, 24.6 miles, in 30 min. 32 sec.; Yatton, near the foot of the Bourton rise, 32.8 miles, in 39 min. 33 sec.; Flax Bourton, 38.9 miles, in 46 min. 25 sec.; Bedminster, 43.7 miles, in 51 min. 56 sec.; and Bristol, 44.8 miles from Taunton, was reached in 53 min. 49 sec., or just inside the 54 min. allowance. Speed fell on the Bourton ascent from 58 to 48 m.p.h., and subsequently rose to 65 m.p.h. No. 3029, on the same train, had 60 tons less to haul throughout, and did



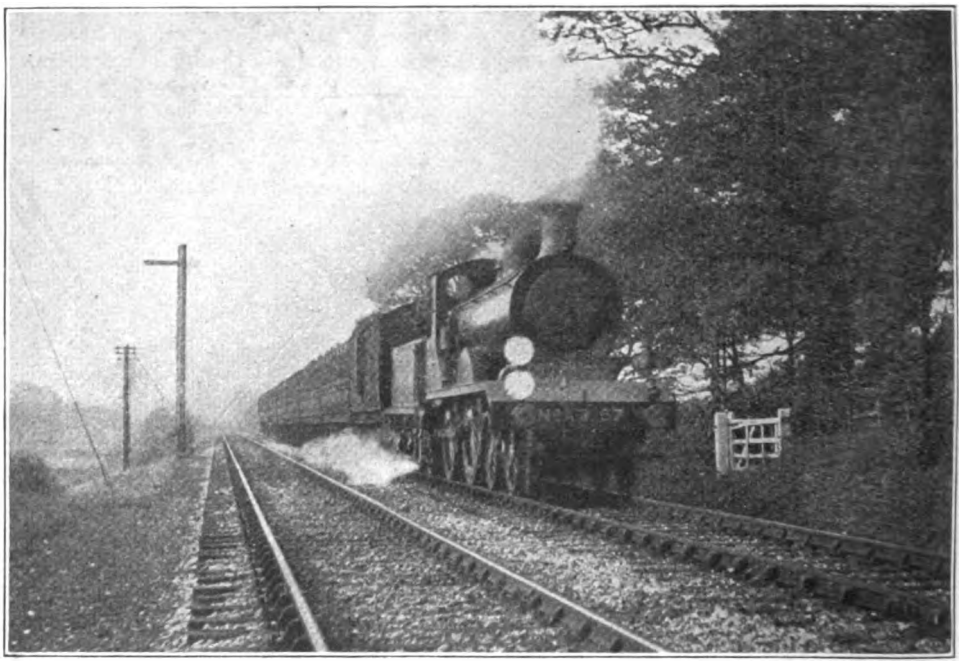
Photo] [*W. H. C. Kelland.*

SOUTH EASTERN AND CHATHAM RAILWAY

Up slow train travelling at 25 miles per hour through Grove Park.
Large 4-4-0 superheater locomotive, No. 772.

Digitized by Google

well, despite some disheartening delays. In the first place, the brakes leaked on at starting, and brought the train down to a slow walking pace in Taunton East Yard, with a loss of 1½ min., so that it took 10 min. 1 sec. to pass Durston. But the acceleration thence was rapid, Bridgwater being passed in 16 min. 7 sec.; Highbridge in 22 min. 30 sec.; Bleadon in 28 min. 52 sec.; and Puxton, where the speed was being sustained at 65 m.p.h., 29.2 miles, in 33 min. 20 sec. Then came a dead stop of 48 sec. for signals, but, despite this delay, speed rose to 53 m.p.h. Yatton in 33 min. 21 sec.; Flax Bourton in 39 min. 6 sec.; and Bedminster in 43 min. 55 sec.—here "even time" had been practically achieved—and an arrival was effected at Bristol in 45 min. 38 sec. from the start, nearly 6½ min. under schedule time. On the level before Yatton speed rose to 73 m.p.h., and again near Bedminster to 70, after a minimum of 58 at Bourton, the 37.9 miles from Durston to Bedminster occupying 36 min. 2 sec. On another occasion No. 3016, *Lightning*, rebuilt with a large Belpaire boiler, ran from Weston-super-Mare to Taunton,



Photo] [*P. S. A. Berridge.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Down Portsmouth train near Holmwood. 4-4-0 locomotive, No. 57.

on 3½ miles preceding the rise to Bourton, and only fell to 50 on the ascent, so that, with a final maximum of 69 m.p.h., Bristol was reached in 33 min. 50 sec., or just inside schedule time. But the net time was only 48½ min.

The finest run, however, was made by No. 3032 with a lighter load of 190 tons throughout, the work on this occasion being really brilliant. Durston was passed in 7 min. 53 sec.; Bridgwater in 13 min. 39 sec.; Highbridge in 19 min. 45 sec.; Bleadon in 25 min. 58 sec.; 26.1 miles, in the smart time of 29 min. 48 sec., or 5½ min. inside a somewhat easy allowance of 35 min., attaining 64 m.p.h. on the level at Bridgwater. On yet another run in the same direction No. 3010, *Fire King*, was piloted by a 4-4-0 "Camel" from Taunton up to Whiteball summit with 280 tons, covering the 10.9 miles in 15 min. 32 sec. After a brief stop of only 49 sec. to detach the pilot, *Fire King* then ran down from Whiteball to Exeter, a by no means immoderately steep descent of 19.9 miles,

Digitized by Google

in the surprising time of 19 min. 43 sec., start-to-stop, attaining 77½ m.p.h. beyond Collumpton. Thus the total time, stop included, was only 37 min. 4 sec. for the 30.8 miles from Taunton, 2 min. having been gained on a 39-min. schedule. In view of such achievements, it seems tragic to realise that the last of these famous engines has now been scrapped.

From the G.W.R. I pass to a fine effort on the up L. and N.W. Birmingham pre-war express due in Euston at 6.10 p.m., in the days when 63 min. were allowed for the 57.5 miles from Blisworth to Willesden. On the run in question a load of 140 tons was horsed by a little 2-4-0 "Precedent" class engine — more familiarly known as a "Jumbo"—No. 863, *Meteor*. Leaving Blisworth 3 min. late, *Meteor* breasted the gentle ascent to Roade, 3.0 miles, in 5 min. 55 sec., and then covered the 7.4 miles down to Wolverton in 6 min. 54 sec., with a maximum rate of 70 m.p.h. on Castlethorpe troughs, and the 5.8 miles on to Bletchley in 5 min. 25 sec. Speed still ruled high on the gradually rising grades past Leighton and Cheddington, the 6.5 miles from Bletchley to Leighton taking 6 min. 11 sec., and the 4.1 miles thence to Cheddington 3 min. 59 sec. Even up the final long 1 in 330 ascent, the rate continued consistently at 56 m.p.h., but for a final fall to 53 at this summit through premature notching up; so Tring was passed in 4 min. 40 sec. from Cheddington, 4.3 miles; 14 min. 50 sec. from Bletchley, 15 miles; and 33 min. 4 sec. from Blisworth, 31.2 miles. All lost time having now been regained, the driver took things easily on to Willesden, such times as 14 min. 3 sec. to Watford, 14.2 miles, and 12 min. 6 sec. thence to Willesden stop, 12.1 miles, only requiring the most modest of effort. Even then the total time of 59 min. 13 sec. from start to finish showed a gain of 3¾ min. on schedule, but, as my friend points out, with faster running south of Tring this figure might have been reduced without any difficulty to 57 min., or under "even time" from start-to-stop.

As a final *bonne bouche,* I have reserved the description of a run on that

Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Up Red Cross train approaching Bedford.
4-4-0 M.R. engine, No. 559, rebuilt with superheater.
Train consists of London and North Western and Great Western Red Cross vehicles.

Digitized by Google

most famous of trains—the 3.40 p.m. from Manchester (London Road) to King's Cross, as between Sheffield and Grantham, where the motive power was always supplied by the Great Central Company. Until the 10-wheeled engines undertook this turn, the work was generally entrusted to one of the Pollitt 4-4-0's, which have some extraordinary achievements to their credit, and this is undoubtedly one of them. The train on this occasion was the south-bound express, leaving Sheffield at 4.48 p.m., and due in Grantham at 5.53 p.m., and the load 150 tons, hauled by No. 696. Woodhouse Junction, 5 miles, was passed in 7 min. 40 sec., and the steep ascent of 5.3 miles thence to Kiveton Park occupied 7 min. 4 sec.; the subsequent 5.2 miles to Worksop were covered in 4 min. 52 sec., and the 7.5 miles on to Retford, where the dead slowing was made for the exceedingly sharp curve into the station, took 8 min. 38 sec. Total for this initial 23 miles of very difficult road was thus 28 min. 14 sec. Once on to Great Northern metals, No. 696 went "all out" for Grantham. On the 1 in 178-200 ascent to Markham Box an acceleration to 50 m.p.h. was recorded, followed by a maximum of 77½ on the 1 in 200 fall from Tuxford. The remarkable fact in connection with the latter figure is that at Newark, after 8 miles of level track, the pace had not fallen below 76 m.p.h.; even at Peascliffe Tunnel, after an upward tendency for 12 miles from Newark, culminating in 4 miles at 1 in 300-200, the speed was still 63 m.p.h. Some extraordinary times were then achieved. Retford to Tuxford, 6.7 miles (including recovery from a 10 m.p.h. slack and the negotiation of Markham summit), took 8 min. 27 sec.; Tuxford to Carlton, 5.5 miles, 4 min. 19 sec.; Carlton to Newark, 6.3 miles, 4 min. 58 sec.; Newark to Claypole, 4.7 miles, 4 min. exactly; Claypole to Barkstone, 5.7 miles, 5 min. 13 sec.; and Barkstone into Grantham, which was approached very slowly, 4.2 miles, 5 min. 12 sec. This made a total of 32 min. 9 sec. from Retford, 33.1 miles, and 60 min. 23 sec. from Sheffield, 56.1 miles, or over 4½ min. below the 65 min. allowed. Most remarkable of all was probably the average of 76.1 m.p.h. from Tuxford to Newark, but throughout the running was simply superlative in character. As I remarked earlier in the present article, however, it would be interesting to know what is the ultimate cost of such achievements on the part of locomotives of such comparatively moderate tractive capacity, as compared with the cost of operating much larger and more powerful types of locomotive now generally employed on the heaviest and fastest duties.

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

Digitized by Google

Agricultural Transport in the Future.

NARROW-GAUGE AND LIGHT RAILWAY DEVELOPMENT IN BRITAIN.

By BASIL MERCER.

". . . where the farm buildings generally lie off the made roads and are accessible only by unmade and often steeply-graded tracks, a light railway may be preferable (to motor lorries). . . . But the matter is not one for the agriculturalist alone; the industrial penetration of the countryside . . . makes it of a far wider national importance."—Extract from TRANSPORT, Cd. 9079, Ministry of Reconstruction, Agricultural Policy.

The Need for Improved Means of Transport.

AT the present time very little consideration is given to the commercial possibilities of narrow gauge and light railways for solving the all-important problem of agricultural transport. Whenever the question is raised, people say naively that the Government is going to improve the existing roads out of recognition and construct an infinite number of new ones. There is already in existence a Road Board that is pledged to all manner of post-war schemes, practicable and impracticable; it cannot be doubted that this project will receive a good deal more support than it deserves, owing to lack of appreciation of many salient points that are intimately connected with the desired result. Even now, an impression is being created, by interested or disinterested parties, that the motor 'bus and motor lorry are the best solution of all difficulties relating to the transport of passengers and merchandise in country districts. In this respect England, as usual, seems to have been at pains to take up an entirely different attitude to most nations: a most cursory examination of the internal commerce of both North and South America, India, the Continent of Europe, the East and West Indies, and Ireland, to name only some of the more prominent instances, reveals the very obvious fact that an enormous use is being made of extensive systems of narrow gauge railways.

It is quite impossible to suppose that all these countries are hopelessly mistaken, and that we alone are on the right track in this matter. It is most curious to notice that the initiative for extending the use of narrow gauge lines here should have been taken by the Government, as may be seen by the quotation given above; when "the English of the Island," as Kipling calls us, have recovered from this surprise, it may be that the question will be seriously discussed and examined, not merely by the farmer and the vendor of farm produce, but by the investor, urban district councils, merchants in general and the builders of rolling stock.

Progress Abroad.

It is only necessary to take the most casual glance at what has been done in other lands to become convinced of the fallacy that a series of light or narrow gauge lines would be unsuitable for English conditions, although those who allege that such methods of transport are unsuitable for this country are quite unable to give any coherent reasons for their opinion. Why there should be greater difficulties in Britain than in France, Germany, Austria or Scandinavia, one is left to find out; possibly certain local conditions will affect minor details of administration, but in the two last-named countries the difficulties of operating any kind of railway, light or standard, broad or narrow gauge, are a great deal worse than they are here. Wherever we look we see an immense mileage varying

Digitized by Google

from 2 ft. to 3 ft. 6 in., over which is conveyed with safety and expedition a far heavier traffic than English experts imagine. In the case of the opening up of a new country railways are invariably made before roads.

Road Transport.

Much may be said for heavy road motor vehicles as feeders to the existing railways; it is also claimed that they develop rural districts and foster agriculture. It may, however, be observed that these points are also possessed by a narrow gauge railway. There is, doubtless, powerful opposition to be faced from firms interested wholly or principally in the construction of internal combustion engines and from firms and syndicates purveying oil. The motor lorry is extremely useful in certain situations, but it has its limitations, one of which is that it requires an exceedingly good road. Now, to make a roadway suitable for carrying such heavy traffic as this is a very costly affair, owing to the necessity for increased strength in every detail and the avoidance of heavy gradients; the plea that the motor vehicle can use the existing roads while a railway entails new construction will not bear examination; a road that will carry a really heavy traffic must be as solidly laid as the road-bed of a standard railway line. Whatever form of road construction or surface material be employed the distribution of weight can be carried out far more completely with a railway track owing to the actual point of contact, the rail, being of a highly concentrated strength and to the excellent diffusion of surface pressure obtained, transversely and longitudinally, by the sleepers. On a road, the "hammer blow" falls in one spot, tending to make a depression in the surface after a very short period of service.

The wear and tear of ordinary road surfaces (and of the vehicles using the same) is enormously greater than it is on a railway track when heavy weights, 3 tons and over, have to be transported. Proof of this may be seen by observing the condition of the roads leading to any military camp, where the existing road has been used by heavy lorries. In a case such as this, the road surface has gone to pieces at once, especially if the weather has been damp; constant repairing has been necessary, and the result has been a very rough track, which has been the cause of innumerable breakdowns to the vehicles using it. It may be urged that it is not proposed to use the ordinary roads, a special road being adopted which would take traffic of this sort without mishap. If this is done, one of the great arguments against the railway, the cost of construction, disappears at once; if a special road must be laid down, why not a railway straightaway?

Roads for Heavy Traffic Sometimes Impracticable.

When considering the use of roads for heavy traffic the nature of the country traversed must be taken into careful consideration; in some parts the actual surface of the land is too delicate for any but the lighter sort of vehicle, no matter what form of road surface be used. A tourist, who was interested in the stone trade, was wandering about the North of Scotland; during one of his rambles he came across a remarkably fine bed of stone, located some 7 miles from a deep-water harbour, but about 40 from the nearest railway. Hearing that the price of this land was very cheap he determined to buy, thinking that he would get a wonderful bargain, but, fortunately, before completing the purchase, he happened to meet someone who knew the district well. The tourist had casually mentioned his "find" to the other who asked him how he proposed to get the stone away from where it lay. The quarry owner said that he was going to cart it by the existing lane to the sea, and was asked by his acquaintance if he had seen the road; he replied that he had, that it was not very good, and that he intended to repair it; then the other pointed out to him that the surface would never stand any weight, owing to the ground being too spongy, and that if he wished to get any satisfactory track he would have to conduct operations similar to those of George Stephenson when taking the Liverpool and Manchester Railway across Chat Moss. Had the intending purchaser thought of using a light railway, which could easily have been laid owing to the load being spread over a wider area, he would have been able to turn his discovery into a commercial success.

Digitized by Google

Except in the hilly parts the surface of England is generally not firm enough to take a road-bed suitable for heavy traffic without embarking on costly engineering work; unless the ground is very hard the railway has a decided advantage over the road. This has been proved over and over again during recent operations on the various war fronts. In the Desert of Sinai, where the surface is hard, motor lorries were employed with conspicuous success, but in the majority of cases some form of railway has been found necessary. In East Africa, in particular, motor chassis were mounted on flanged wheels, as it was always found more practicable to make railways than to make roads; these were used owing to a shortage of steam locomotives, and because they would otherwise have been altogether useless. The construction of a railway was found to be quicker and cheaper than roads, and the result was a greater efficiency in operation. In many cases it was possible to make a railway where it was quite impossible to make a road.

Alleged Greater Flexibility of Road Transport.

A service of independent road motor vehicles is often described as being "flexible"; that is, if one vehicle breaks down, it can be replaced easily by another of the same kind, whereas a block on the line stops all traffic over that section. But it must be remembered that in rural districts of sparse population the number of lorries or omnibuses in service is generally small, if it be desired to work the service with due regard to economy; therefore, if one car gets out of service, its absence is apt to cause grave dislocation. On a railway that is properly maintained there are two situations to be considered; either the plant is of such high character and the operation so efficient that accidents are very few and far between (if they do occur, there are in such cases adequate facilities for repair or renewal), or the plant is of such a very light nature that it can easily be removed, repaired or replaced. It has also been stated that a motor service can be diverted from one road to another without special preparation; the service will not be interrupted if there is some obstruction on the road generally used, whereas the railway, having its special track, is helpless if there should be a block on the line. This argument is not very sound; when large and heavy cars are employed, *any* road cannot be used; in most country districts the alternative to the main road is a tortuous and steeply graded lane, along which the passage of a big lorry would be attended with both difficulty and risk.

One grave difficulty that will always mitigate against the steady and successful operation of a road service is snow. Even in England heavy snowfall is sufficient to impede road traction seriously, if indeed it does not put an end to all traffic on the roads; snowblocks on railways, even in the remote Highlands of Scotland, are of very rare occurrence. Two or 3 miles of hilly road, whose surface is covered with firmly caked hard-frozen snow to a depth of, say, 4 in., will be practically impassable to any ordinary commercial road motor vehicle; dwellers in the country have this fact painfully brought home to them during the winter, especially if a road transport service is their only means of communication with the world.

Narrow Gauge or Light Railways.

For serving the transport needs of rural districts by rail there is a choice of two alternatives: you can have a narrow gauge line or a light railway of standard gauge; each system has its own peculiar advantages. The narrow gauge line is much cheaper to construct and equip, especially if a small gauge, such as 2 ft. or 2 ft. 6 in., be adopted. Should the traffic warrant it, the main line can be of heavy construction, capable of taking almost any load that the district can give it; powerful engines can be used and fairly high speeds attained. On the branches, the *matériel* can be of the lightest description; the track can be obtained in complete sections, which can be practically thrown down anywhere, by the side of a field along the hedgerow or into a barn; this would be quite suitable for light wagons, though large locomotives might not always be able to traverse a temporary track like this. The narrow gauge has also another great advantage: sharper curves can be used; consequently, a line can be laid in country where there is not room for a standard gauge line.

Digitized by Google

On the other hand, the light railway of the normal gauge has one very solid point in its favour: any ordinary rolling stock of the main railways of the country can be worked over it, provided that the weight and measurements are not too excessive. The cost of equipment is, of course, greater than with the narrow gauge line, even if everything connected with it be really "light." If a line such as this is a branch owned by one of the big railway companies, the identity of gauge will enable any old coaches and wagons, or even engines on occasion, to be used straightaway, or easily adapted. But it will not be so handy as a narrow gauge line with its small wagons, that a man can push about a farm, for example.

Transhipment is a "bogey" that is very often raised, but it can easily be laid: for one thing, there is a great deal of transhipment carried out when there is no break of gauge at all; all general traffic would probably be dealt with in this manner. In the case of special circumstances or materials, such as bricks or vegetables conveyed in bulk, when, for obvious reasons, it is desirable to avoid transhipment altogether, the difficulty can be overcome by the use of carrier wagons on the narrow gauge lines which convey the standard gauge vehicle bodily with its load. On the Leek and Manifold Railway, where this practice may be seen, there is no handling of goods and no delay, the process being hardly more troublesome than transferring a wagon from a main line train to a branch goods train. The method is simple: the carriers are low-sided wagons with platforms extending outwards from the lower parts of the body. In the platform are slots shaped like tram rails, which provide a standard gauge track on the wagon platform. All that has to be done when transferring a standard gauge truck from its track to the transportation car is to run the latter up to the buffer stop, the narrow gauge road being laid so far below the level of the standard gauge track that the rails of the wider gauge exactly meet the channels on the carrier, the bogie centres of which lie immediately under the two axles of the ordinary goods truck. Two screw wedges placed beneath the wheels of the truck keep it in position on the transportation car.

Less Power Required on Rails.

The amount of power required to haul a load on rails is, *caeteris paribus*, ten times less than that required on roads; as this is an established fact, it is obvious that there must be a great economy in motive power in the case of a railway. Where rails are laid, the steam locomotive is *per se* the most economical form of tractor in use: the types available are very varied, from the light Decauville French machine to the massive engines of the Barsi Railway in India. Quite apart from economy in working, the steam locomotive has another great advantage—it burns coal; if the internal combustion engine be employed, the supply of fuel has to be obtained from overseas, whereas coal in any quantity is obtainable in this island. Steam traction used on roads is, of course, open to all the objections (except the question of fuel) that apply to oil-driven vehicles, on account of the track being a *road* and not rails. On the other hand, oil, if sufficiently cheap and plentiful, may be used satisfactorily as a source of power on a railway. Again, in cases where a supply of electricity is available, it may be used without difficulty and to advantage on railways, whereas its use on road vehicles, in so far as its very limited employment enables us to judge, is so beset with mechanical difficulties as hardly to be worthy of consideration. This point of the use of electricity is of great interest, as there is a probability of central power stations being erected, which will make possible a very cheap supply of current; the generator may be a stationary steam engine, which can be constructed to work with extraordinary economy, or, where it is available, water power, either from rivers or tideways. In certain cases, such as lines that run about farm premises or that are similarly situated, horses can be used without fear of cruelty or overstrain; one horse will draw on rails a load that will need a team on a rough country road, especially if the going is soft.

Another form of motive power could be used by employing what is called a "Loco-Tractor"; this consists of a motor tractor with the engine situated over the rear axle, the front part of the car being carried by a four-wheel truck which runs on 2-ft. gauge rails; the load

Digitized by Google

is conveyed by wagons running on the lines. The driving wheels have rubber tyres, and run on macadamised ways alongside the railway track. This method combines the advantages of the great adhesion of a road surface with the slight friction of wheels on lines, and, as there is no locomotive, the rail weight can be cut down by half. This, however, is counterbalanced by the extra expense of constructing and maintaining the road tracks, the problem that it is most desirable to avoid; for this reason alone, it is doubtful if the apparatus would be as reliable as a proper railway, while the mechanical defects are obvious. It is superior to a motor with road trailers just as a horse tram is superior to a horse 'bus. The idea is not altogether new: a Frenchman, M. Larmanjat, brought out something similar about 1860, but employing only one rail; the device was not a success, principally on account of the road giving trouble—the road was strengthened and strengthened, first with planks, then with heavier timbers, finally with metal plates; when this stage was reached the proprietors seem to have come to the conclusion that they might as well have a railway and have done with it.

British Narrow Gauge and Light Railways Now Open.

Before condemning the light or narrow gauge railway as a means of transport in country districts, those who object to this solution of the problem may be reminded that there are already many systems now open in this country, though the mileage is insignificant in proportion to the narrow gauge and light railway mileage abroad. Taking the period immediately anterior to the war, every European nation had a vastly greater proportion of these little lines than England; in the Colonies (both British and foreign) and in various undeveloped countries, the proportion is very much greater. Among the home examples of light railways may be mentioned the Kent and East Sussex; the Wisbech and Upwell Tramway; the Weston, Clevedon and Portishead; the Mid-Suffolk Light; the Nidd Valley Light; the Bideford, Westward Ho!, and Appledore; the East Kent; the Great Western Branch from Tiverton Junction to Hemyock; and the Highland branch from The Mound to Dornoch. Turning to narrow gauge systems, those in Ireland are too numerous to give a list of—Ireland is far more progressive than England or Scotland in this respect! In Great Britain may be seen the Lynton and Barnstaple; the Festiniog; the Southwold; the Campbeltown and Machrihanish; the Leek and Manifold section of the North Staffordshire Railway; the Corris; the Glyn Valley; the Isle of Man; the North Wales Narrow Gauge; the Ravenglass and Eskdale (now being successfully worked as a 15-in. gauge line); the Tal-y-llyn; and the Rye and Camber. In the Emerald Isle County Donegal alone accounts for some 200 miles with the Londonderry and Lough Swilly and the Donegal Joint Lines. From these examples it will easily be seen that there is no startling novelty in the suggestion of this means of transit; it has been successfully tested, and the results may be viewed by anyone who will take the trouble to investigate, while, if additional data be required, these can easily be supplied from the records of similar lines abroad.

Speed and Loads.

The opponents of light and narrow gauge railways sometimes make the statement that such undertakings would be of very limited use commercially because of their necessarily low speed. In the former case, as the whole construction is "light," there are bound to be considerable differences when the comparison is made with a standard main line, both as regards speed and loads. The narrow gauge line, however, is not of necessity "light"; in some cases, where the circumstances warrant it, it may be of the most sketchy construction, with rails and sleepers united together in portable sections and the lightest of light rolling stock; railway equipment of this kind will be of great use in the near future on farms or large estates (the Duke of Westminster's Eaton Hall property, for example, which has a 15-in. gauge, is a case in point), or in and about large works that are situated some distance from railway or navigable water. On the other hand, the track and equipment may be of the same high standard as that of a first-class English railway; the 2-ft.

Digitized by Google

gauge Festiniog Railway in North Wales is an excellent example of this kind of undertaking, and there are numerous cases abroad of lines on which speeds are as high in proportion as they would be on any standard gauge line performing the same kind of work in similar country; there is, in fact, an infinite variety of examples of the truth of this remark, the gauge being anything between 15 in. and 3 ft. 6 in.

Heavy rolling stock is not uncommon; the Kent and East Sussex, which is a standard gauge light railway, employs locomotives weighing 43 tons and bogie passenger carriages over 40 ft. in length. Two very interesting instances of heavy rolling stock on the narrow gauge are the Kalka-Simla and Barsi Railways, both of which are in India; as showing what can be done in the way of dimensions, the bogie passenger coaches of the former line are no less than 7 ft. in width, which, it must be admitted, is generous for a gauge of 2 ft. 6 in. The Barsi Light Railway, also of 2 ft. 6 in. gauge, uses engines of 36 tons weight and coaches 40 ft. long and 7 ft. 6 in. wide, while its bogie wagons carry nearly 16 tons with a tare weight of 4 tons 2 cwt.; a 35-lb. rail is used. Although the gauge is small, Galloway boilers 28 ft. 6 in. long by 7 ft. 6 in. in diameter, weighing 14 tons, have been carried. The Yorkshire Engine Company built some very large machines for the Bolivian Railways, which have the same gauge; these locomotives, which are of the Fairlie type, weigh no less than 52 tons in working order.

As mentioned above, speed on narrow gauge railways is merely a matter of proportion: the 3 ft. 6 in. gauge gives 62.5 m.p.h. on the Java State Railways with 67-lb. rails, though the South African Government Railways are content with 55 m.p.h. with 80-lb. rails; in the latter case much higher speeds could be run with perfect safety. On the 2-ft. gauge the Festiniog Railway, with a 50-lb. rail and curves of 165 ft. radius, limits the speed to 20 m.p.h., but very little of this line is straight; the Otavi Railway (German), South West Africa, using only 30-lb. rails, but with curves of 500 ft. radius, allows a maximum speed of 25 m.p.h., and a speed of 30 has been attained.

Cost.

It has often been urged that, even if there be greater advantage in having a light or narrow gauge line for a particular service, the cost of the railway is prohibitive when compared with a road service. This objection is best answered by quoting from a report to the Light Railways Development Commission:—"Report by G. A. Burls, M.I.C.E., upon the Relative Costs and Advantages as between a Light Railway and a Road Motor Service from Headcorn to Robertsbridge, 1913." This report, which is exhaustive, compares every point of cost and maintenance between the two systems; the railway is, of course, the Kent and East Sussex, and many varieties of road vehicles were tested in opposition, both petrol and steam. After a careful analysis of all data, Mr. Burls says:—"The conclusion reached is that the existing light railway deals with the goods and passenger traffic of the district at, roughly, 60 per cent. of the cost that would be incurred by a road motor vehicle undertaking doing the same work." This shows the enormous saving rendered possible by using a railway, especially when it is remembered that the line under consideration is only a light railway "within the meaning of the Act." The Kent and East Sussex is as solidly constructed as most large companies' branch lines; it is of standard gauge, and is laid with 80-lb. rails; as noted before, the rolling stock is on the heavy side. If a line of this description in a country that is mainly agricultural can be worked more cheaply than road transport in the same district, it follows that the saving would be even greater with a narrow gauge line; for one thing, the capital outlay would be very much less. From every point of view, the evidence is entirely in favour of the railway.

Preservation of Comfort and Natural Beauties.

This is an important point in an age when everything round us tends to become ugly; from the social point of view it is extremely desirable that people should live as far as possible in beautiful surroundings; if they are not able to do this, it should be possible for them to be able to visit scenes that please the eye. This has a far-reaching psychological

Digitized by Google

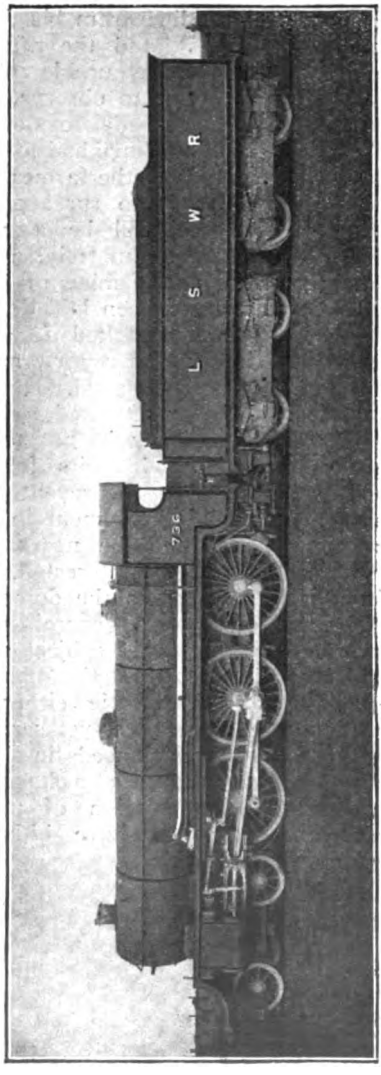
bearing. Now, any railway, particularly when of narrow gauge, is less unsightly and less disturbing to the amenities of the landscape than a heavy motor lorry charging along a winding and picturesque country road, raising clouds of dust; with the former mode of transport there is no dust, no destructive vibration, and little noise. The old-fashioned English prejudice against any kind of railway, "because of the lines," must not be forgotten; it must be met by a campaign of education and by practical demonstration that the evils of a railway are not what they seem to the imagination. It is possible that this prejudice has been fostered by those interested in the development of road traction, including owners of pleasure cars, as well as by people who hate anything of which they have little knowledge. As we have seen, examples can be shown, in our own country, of light railway practice that ought to convert even the most stubborn from their somewhat narrow-minded point of view. Those who merely wish to preserve the great beauty of our British scenery may be urged to go and see a narrow gauge railway in operation, and so verify for themselves the fact that such an undertaking does not spoil the landscape.

Conclusion.

The whole question of rural transport has lately become of paramount importance, owing to the development of agriculture. It is not, perhaps, generally known that Ireland, which is supplying us with large quantities of farm produce, a quantity that has been enormously increased since the beginning of the war, has a fairly extensive system of light and narrow gauge railways; these lines have rendered possible the transport of this produce to the railways proper, and so to the English market. It is true that co-operation has been a powerful factor in this successful trading, but there is no reason why a similar idea should not work in England. Agricultural co-operation is not exactly a railway problem, so it need not be discussed here; it will be necessary, however, in the future for all concerned to co-operate closely, in the national interest; the farmer must send large consignments, there must be means of transport (a light line from his farm to the main railways), and the railway companies must quote favourable rates; this last, it is only fair to observe, the companies have been ready to do for some time past, but they have had to face the innate conservatism of the farmer and the lack of "feeders" to rural parts. After the war, there will be a vast quantity of light railway material available from the hundreds of miles of military railways that have been laid down; if this material is earmarked for the development of internal transport, much initial expenditure may be saved. During the war agriculture has attained a high state of efficiency; it ought not to be allowed to drop back into its former moribund condition, but to prevent this happening a radical improvement in the means of transport will be necessary. In conclusion, all who are interested, not only in agriculture, but in the domestic trade of Great Britain in general, may be counselled to study this subject very closely; they will find that the narrow gauge railway, costing little either in construction or maintenance, yet serving adequately all commercial needs in those districts which cannot support a standard line, will prove the solution of many transport problems that have hitherto been considered insoluble.

Digitized by Google

London and South Western Railway New Passenger Engines.



NEW 4-6-0 EXPRESS ENGINE. NO. 736.

IN the RAILWAY MAGAZINE September, 1917, there appeared a diagram of the latest type of London and South Western Railway passenger locomotive, ten of which were undergoing construction at the locomotive works at Eastleigh.

Now, by the courtesy of the London and South Western Railway, we are able to illustrate No. 736, the first under steam of the ten engines. Constructed for express passenger work, its details are to a large extent duplicate of the mixed traffic engines built in 1914. It is fitted with Mr. Urie's "Eastleigh" superheater, the Detroit four-feed hydrostatic lubricator having bull's-eye glasses, the Vacuum Company's 25-20 Dreadnought ejector, Gresham No. 11 hot water injectors, an exhaust steam tubular water heater on tender, Siemens electric pyrometer for measuring the temperature of the superheated steam in cylinder chest, a steam boiler tube cleaner which is connected to a steam cock on the side of smokebox, and the standard vacuum brake and train heating fittings.

The principal dimensions are as follows:—Coupled wheels, 6 ft. 7 in. diameter; cylinders, 22 in. diameter; stroke, 28 in.; heating surface—small tubes 1,252 sq. in., large tubes 464 sq. ft., firebox 162 sq. ft.; total 1,878 sq. ft.; superheater surface, 308 sq. ft.; grate area, 30 sq. ft.; working pressure, 180 lb. per sq. in.; tender capacity—water 5,000 gallons, coal 7 tons; weight of engine and tender in working order, 134 tons 18 cwt.

Digitized by Google

The Principles of Freight Train Operating.

By DENIS O'DONOGHUE.

TO provide the means of transport of the necessaries of life and materials from the source of origin to the seat of consumption is the chief function of railways; conveyance of passengers is a secondary duty. Carriage of merchandise, minerals and other classes of freight involve a great deal more than the scheduling of a number of trains from starting points to terminals, collecting traffic *en route*. Broadly, the basic principle is the movement of complete trains of freight from one place to another, with ancillary services covering intermediate places and local trains clearing short distance traffic, and on this frame, fitting the requirements as closely as practicable, hangs the whole structure.

To start a train with a full load necessitates, in the majority of cases, the concentration of trucks loaded at different places at an adjacent depôt; only at the goods yards of the large commercial cities can complete trains of freight be made up for one destination, and those the principal, *e.g.*, Bristol to Manchester and vice-versa. For concentration a yard for the reception of wagons brought in by local services is required. Local services collect loaded trucks along a prescribed route, and in the yard they are separated and sorted to make the trunk line trains in the manner illustrated in the sketch (Fig. 1).

From the depôt are started trains for various destinations according to traffic requirements, through trains being made for as many destinations as are warranted, the terminals, like the starting point, being, with few exceptions, depôts serving an area where the trains, on arrival, are broken up and the wagons distributed to the actual destination stations by local trips, thus giving the method the form shown in the diagram (Fig. 2).

There are, however, limits to the possibilities of full through trainloads made up from one depôt to another as illustrated, and to meet the principle of complete through trains the load is suitably adjusted at the starting point, wagons being attached for an intermediate depôt or station, at which place trucks can be taken on for the destination, thereby assuring a trainload for the whole journey. This practice is not universal, as it may be that instead of detaching and attaching intermediately, the better plan is to load the train at the starting place with trucks for two depôts within easy distance of each other, a common arrangement in respect to long distance trains conveying general goods and merchandise (Figs. 3 and 4).

Another method frequently resorted to in order to secure full loads for trains, by which means alone is train mileage held to a minimum, is that of making exchanges *en route* between two trains. Exchange of traffic *en route* is carried out in the following way (see Fig. 5):—A train A to B cannot obtain a complete trainload from starting point B, but it can with traffic for B and D, and by taking on at E, an intermediate place, wagons for B, dropping there the trucks for D, the train can run into B with a full load, hence a complete train runs over the whole route A to B.

Depôt E may be a place where trucks for B are collected, in which circumstance the operation is similar to that represented in Fig. 3, or it may be an ordinary station with siding room where trucks for B are detached by an earlier train travelling a different route for the purpose of being taken on by the train from A to B. A train from C to D timed through E later than the A to B train can take on the trucks for D put off by A to B train, and could detach wagons for A or B brought from C to be cleared by a later train over the A-B line. Direct exchanges can be made between trains travelling the routes A-B and C-D shown in the sketch by loading trains from A to B with wagons for B and D, and by carrying traffic for D and B by trains working from C to D, the trains being booked into E together.

To enable the work of transfer of loads

Digitized by Google

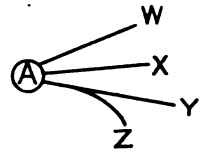
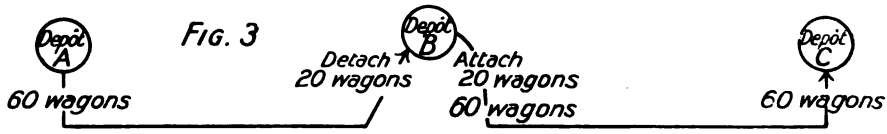


FIG 1

A. Concentration Depôt for sorting trucks.
W,X,Y,Z to A. Local services collecting traffic en route for Depôt A.

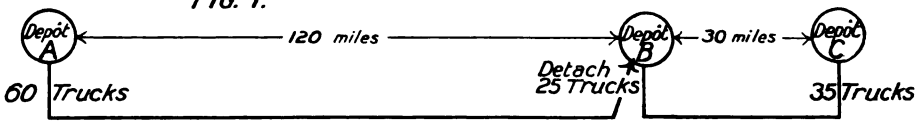
FIG. 2.

FIG. 3



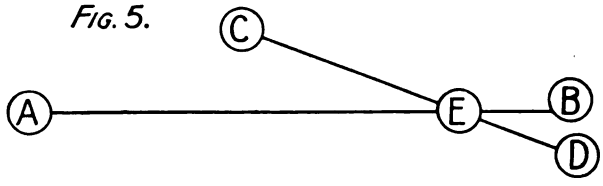
Complete train load not obtainable Depôt A to Depôt C. Train leaves Depôt A with full load for Depôt B and attaches there trucks for Depôt C in place of those detached and therefore carries a full load over the whole route from Depôt A to Depôt C.

FIG. 4.



Long distance goods train Depôt A to Depôt C, 150 miles. Complete train not obtainable Depôt A to Depôt C. Train made up with 25 trucks Depôt A to Depôt B 120 miles and 35 for Depôt C 150 miles. Load —— 60 trucks 120 miles.
35 " 30 "

FIG. 5.



Digitized by Google

en route to be carried out with satisfaction the make-up of trains must be arranged appropriately, the trucks to be detached being placed on the train next the engine—subject to any modification desirable in consequence of a train running with a part load of automatic braked vehicles or for some particular working reason—so that on reaching the place of exchange the train engine can put the wagons to come off on a siding line, take up the wagons to go forward, unite with the remainder of the train and move away without delay.

Referring to the formation of trains for exchanging traffic *en route* leads to that important branch of freight train working embodied in the term "marshalling of trains." For facility and economy of working freight trains should reach their terminal depôts so formed that they can be disposed of speedily and accurately. Trains to a depôt distributing to a number of branches and short sections should arrive with that traffic so formed in the train that the wagons for each branch or section of line are together in order that shunting in breaking the train up is not incurred to excess. A train into a yard from whence the trucks it conveys will be distributed to four districts should be in four distinct parts with the trucks for each district together. Four shunts to break up such a train are enough, but if the wagons for the different destinations are not grouped the work would be needlessly prolonged. Trains with wagons to detach at several places on its journey should have the trucks for each place together so that one shunt to detach at each station suffices.

With a complicated service for the transport of freight on these lines it is apparent that changes must be warily approached, and careful thought covering a wide field devoted to any contemplated alterations. The organised service may be likened to a spider's web, that a touch will shatter, or the works of a watch brought to a stop with the slightest interference. It is a delicate piece of machinery, unable to suffer tampering with by untrained hands.

For the purpose of performing all the operations needful to the making up of freight trains and forming them so that the work can be properly carried out organised yards are necessary. Too much care cannot be expended on the design of a marshalling yard, and its lay-out demands the highest theory, qualified with the practical working requirements of the neighbouring running lines. Freedom of movement, without the fouling of the main running lines, is of first importance. Shunting that occasions the fouling of the running lines means the cessation of work at times, engines and staff standing idle, and a reduction of the working capacity of the yard. A valuable attribute is that of the means of communication with the locomotive shed by an independent line from the yard, by the provision of which a means of escape is found from the frequent recurring block of the main lines by engines passing between the yard and the locomotive depôt; the crossing of the main line by engines to and from the engine shed cannot, of course, be altogether avoided where yards are laid down on each side of the track. Reception roads on to which trains can run off the main lines, and from which they can be broken up, are essential to any good yard, and they should be of sufficient length and equal in number to take the longest trains and receive the incoming trains at the hour of greatest pressure. A sufficiency of reception roads repays quickly the capital outlay by the convenience they supply for the prompt release of train engines and the quick despatch of through trains calling for traffic purposes. Sidings adjoining the reception roads should be set apart for dissecting traffic brought in by trains into district sections, and another group of sidings provided for the marshalling of the trucks to go on to destination stations. The section devoted to marshalling should be the largest, and have about double the number of roads that the dissecting yard has; the more sidings for sorting the lower the consumption of shunting power.

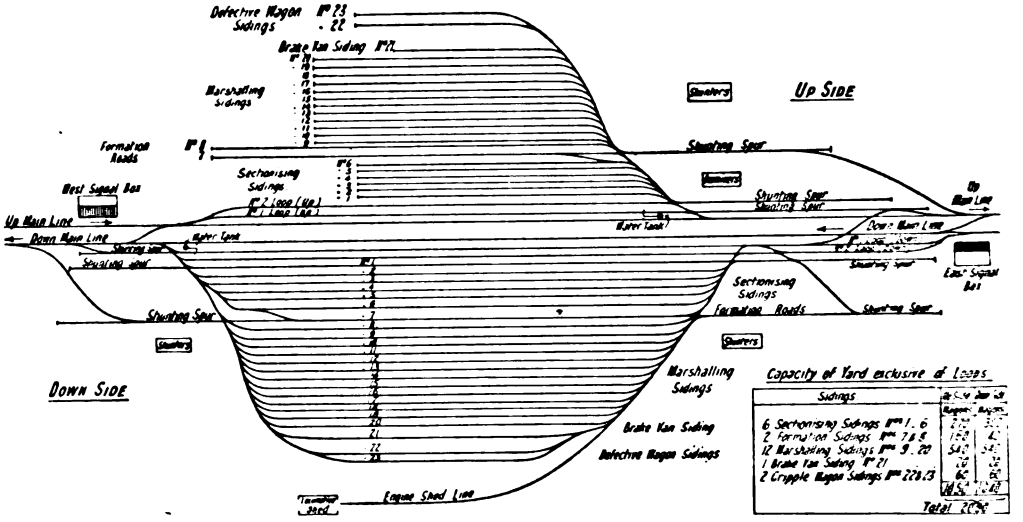
It is usually convenient to divide a depôt into two yards, one on each side of the main lines, the two parts dealing with traffic for the direction served by the main line they are next to.

A gradient falling slightly from the working end, *i.e.*, the end at which the shunting is done in the case of single-end sidings, should be provided for, as it ensures easy shunting and much quicker

Digitized by Google

working than is possible with a gradient rising from the shunting end—a heavy handicap to a yard. The gradient should be about 1 in 300, lifting to level two-thirds of the way down the sidings. Wastage of engine power consequent upon the obligation for the yard engine to cease work during the time a train engine is at work is a defect to be avoided by the laying in of appropriate connections between the sections of the sidings and well-placed shunting spurs.

Gravitation shunting enables trains to be broken up and dissected rapidly and with economy, and looking to the future an expansion of the principle to new and yard for the breaking up of inwards trains arriving at the east end. A train would run on to one of the reception loops at the east signal-box, brakes sufficient to hold the train be pinned down, and the train engine be detached and sent to shed, the wagons then being allowed to run into the correct sidings from off the loop line by the simple process of uncoupling and release of wagon brakes. As a flat yard the line to the engine shed from the east end would be cast out, and a line from the west end to the shed substituted. A flat yard with double-end sidings, workable at both ends, is also covered by the drawing of the Down side.



DESIGN FOR A MARSHALLING YARD. Toral Capacity exclusive of Loops, 2090 Wagons.

remodelled yards is a reasonable presumption.

From the supply of good marshalling yards, apart from the obvious advantages to train working to be reaped, saving in engine power is to be made, detention of trains avoided and traffic expenses generally kept down.

In the drawing on this page an attempt has been made to outline a model marshalling yard combining several features. On the Up side of the main line the common type of yard is shown. Arriving trains run on to one of the two reception loops at the west end, train engines are cut off, and shunting operations are conducted at the east end. On the Down side the sketch includes a design for a gravity

Freight trains in running are classified into long distance goods and mineral trains and ordinary local trains, and the precept, an old-established rule as sound to-day as it was when introduced, is that express goods trains take precedence over ordinary goods and mineral trains, and that a through mineral train, should it overtake a goods train that has to be detained shunting, is to pass the stopping goods train. Distinctive head-lamps are carried, and to speed their passage through trains are signalled from signal-box to signal-box with different bell codes from those used to denote local trains.

On heavily occupied sections of railway refuge sidings and running loops have to be made use of, judicious attention

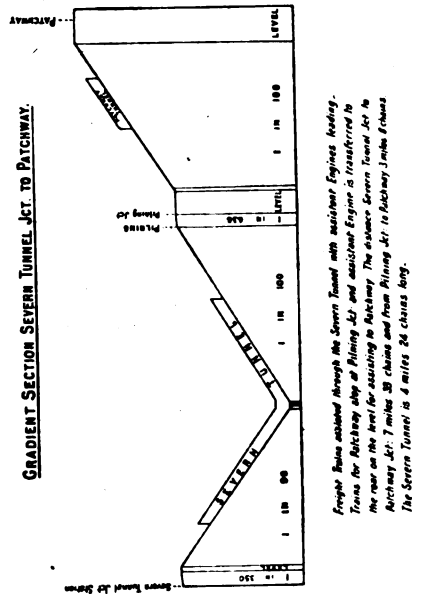
Digitized by Google

having to be given to the convenience of the starting times of trains and their conflict at one or more points on the way with passenger trains. Other circumstances that cannot be foreseen require the holding of trains in refuge sidings and loops, *e.g.*, a freight train leaves A for C, but before reaching C it would be overtaken by a passenger train; it is, therefore, scheduled to shunt at B, where a refuge siding or loop is situated, until the fast moving passenger train has passed.

Running loops have distinct advantages over refuge sidings, as trains will run into loops clear of the main line several minutes quicker than they can back into refuge sidings, the difference varying with the size and class of the train. In congested areas the superiority of the loop over the refuge siding is noticeable to a marked degree. A minute is sufficient to permit of a train being sent on or held back, and a loop will often allow of a train going forward a stage when, with a refuge siding instead of a loop, the gain of ground would not be made. The far-reaching effects of the loss of a running margin, if traced to the full extent of its disturbing influence, would afford an apt illustration of the multiplication of intricacies on a crowded line: its trail of reaction does not end with the train itself, its connections or following trains.

Probably the most perplexing conditions that, at times, have to be faced, and that cannot be avoided, as, for example, when fog, that bane of railway work, prevails, is to have refuge sidings or loops occupied by "dead" trains, *i.e.*, trains that have been unable to reach destination or a yard, owing to a block of trains, and have been left without engine or train crew. Over and above the disorganisation directly accruing from traffic in trainloads standing about the line and engines and trainmen out of place, the possession of the refuging room results in the lengthening, for trains travelling the line, of running sections; with refuge sidings filled two or more running sections are converted into one, and where trains would be able, were the refuge sidings empty, to run to one before being side-tracked, they must have running time to the first vacant refuge, perhaps 20 or 30 miles forward.

Modern powerful engines built for hauling heavy freight trains have had a material influence upon the size of trains on some railways, and although the long train has its opponents on the ground of unwieldiness, advocates of big trains would seem to have all the best of the argument from an economic point of view, and after all is said, the transport of freight is the main object. Certainly there can be no two opinions as to whether it is a better achievement to move 240 trucks 150 miles by three trains than by six trains. Conceding the three 80-wagon trains are 50 per cent. longer on the way than the 40-truck trains, giving a total of 45 train-hours, as against 60 train-hours, the gain is substantial in time of train-


GRADIENT SECTION SEVERN TUNNEL JCT. TO PATCHWAY.
PATCHWAY
LEVEL
1 IN 100
PILNING
1 IN 100
SEVERN TUNNEL
1 IN 80
1 IN 250
Freight Trains assisted through the Severn Tunnel with assistant Engines leading.
Trains for Patchway stop at Pilning Jct and assistant Engine is transferred to the rear on the level for assisting to Patchway. The distance Severn Tunnel Jct to Patchway Jct: 7 miles 38 chains and from Pilning Jct to Patchway 5 miles 6 chains.
The Severn Tunnel is 4 miles 24 chains long.

men alone. The question resolves itself into one of the expeditious transit over the railway of traffic in bulk, increasing the wagon trips and curtailing the occupation of the line.

Dependent to a great extent upon the refuging accommodation along the line, the running of long goods trains is necessarily restricted, as the ordinary refuge sidings at roadside stations do not as a rule allow of the berthing of trains of more than 50 to 60 wagons in them. Lengthening of refuge sidings at intervals of about 15 miles to hold 80 or 100-wagon trains would remove the limitation on the length of trains on this account,

Digitized by Google

and where this work is contemplated the sidings should be converted into loops. An amendment of the Board of Trade regulations confining the operation of facing points to distances not exceeding 250 yards from signal-boxes would be useful in relation to this work; it is an old regulation, and too arbitrary for the improved methods and appliances of the present day.

Inclines make their effect felt very much more upon freight trains than upon the lighter and easier running passenger trains, and the heaviest load an engine can pull up a gradient is the controlling load for trains over the section of line embracing it, and where a sequence of inclines occurs over a section of railway the load that can be taken over the most severe becomes the ruling load.

To avoid the cutting down of loads, due to the difference of the hauling capacity of the engine on the level and up an incline, assistance is often supplied by a second engine over rising gradients, the provision of an extra engine being governed chiefly by the gain in trucks per train to be made, balanced against the sundry liabilities incurred by the supply of an engine solely for the purpose of counteracting the effect of the incline upon the loads of trains passing over it. As a rule, the incline engine assists the train at the rear, running uncoupled so that it can fall away when the summit is reached. An element of safety is provided by the assisting engine at the rear, as should couplings between trucks part on a train climbing a slope its presence ensures that the rear part of a disabled train will not run back. There are circumstances in which it is thought better to couple an assistant engine in front of the train, and this procedure is usually adopted when reverse grades have to be covered by the train, a falling gradient having to be run over before or after negotiating the rising stretch. It is considered prudent, in such circumstances, to prohibit assisting at the rear to eliminate the risk that would arise from a failure, or partial failure, of the train engine; failure of the train engine or parting of couplings on the train with an engine steaming hard at the rear would probably lead to serious results on a downward gradient. When assisting at the rear over reverse gradients is sanctioned, as it sometimes is when the change of gradient is not pronounced, the assisting engine is coupled to the train.

A unique example of the assistance of freight trains is furnished by the working through the Severn Tunnel, Great Western Railway, through which trains run first down, then for a short distance on a level track, and then up a stiff incline for a couple of miles. 75 per cent. of the freight trains through the Severn Tunnel need assistance, which is provided by an engine attached in front, and trains from the Monmouthshire side, mostly heavy coal trains, require assistance after emerging from the tunnel on to Patchway, another stiff climb, and for this section the engine assisting through the Severn Tunnel is transferred from the front to the rear of the train, the change of position supplying the desirable feature of an engine at the rear while mounting an incline, and avoiding a stop at Patching to detach the assisting engine.

In the same way as rising gradients call for special consideration, falling gradients demand particular measures. The Great Western Railway's regulations require trains to come to a stop at the top of steep falling gradients, and the guard to apply wagon brakes, commencing next the engine; the train draws forward, and the engine-driver whistles when brakes in sufficient number have been applied. A minimum time is fixed for trains descending an incline, and a halt is made at the foot for the release of brakes.

In endeavouring to outline the methods by which freight is moved over railways, it is only possible to deal with the primary and straightforward operations comprised in the work, and to present, with little comment, the elementary theories forming the foundation upon which transport by railway is raised. Theory must sometimes be subordinate to practice; circumstances beyond control do not always admit of the application of pure theory, and differences between the two, varying in degree and governed by the relative disparity between the required facilities for putting theory into practice and those available have, at all times, to be reckoned with.

Digitized by Google

Railway Accountancy:

SOME SUGGESTED REFORMS.

By JOHN ORR.

REFORMS are not always synonymous with economies; too often, unfortunately, the real benefits and advantages of the former are sacrificed in the effort to secure the latter—grasping at the shadow and losing the substance.

Accountancy manifestly offers a wide field for economy. Necessity is the mother of invention; economy belongs to the same family. In our case, it leads to savings, both in labour and material, and at the same time effects real efficiency, and, therefore, sound economy, because, the work being lessened, it follows can be more economically and accurately performed; this is a truism! Reforms have already been effected perforce, but much remains to be done. The principal object aimed at may be summarised under two heads: (1) Reduction in clerical work by reducing, or, where possible, abolishing every form, return and book that can be dispensed with; (2) economies in stationery, at present a very costly item. This is embraced in, and is to a great extent dependent on, effective realisation of the first condition.

The first reform necessary is the application and adoption of the principle that all merchandise, mineral and parcel traffic charges be prepaid. If this principle were made absolute, enormous economies would at once be effected. It is a safe computation that no less than 90 per cent. of clerical work, with the necessary stationery, at the stations and headquarters offices, is mainly regarding the differences arising on "inward" to-pay traffic. "Outward" paid items, on the other hand, admit of scarcely any dispute; all experience confirms this, the reason being the charges are made on senders' declaration on the consignment documents of contents, weight, measurements, &c. (subject to check periodically by the railways in their own interest). The difficulties raised against this proposition, principally by agents and shipping companies, are not insurmountable. In most cases, it is simply a matter of buying and selling, and would adjust itself naturally by all goods being purchased "delivered home." Even shipping companies could, in a short time, say, by three months' notice, arrange that all traffic conveyed by them necessitating subsequent railway transit in this country should be prepaid "home"; they holding the necessary authority from senders to pay all such charges; the British railways, after notice, refusing to accept all merchandise, mineral and live stock traffic unless their charges are prepaid. This is a complete reversal of the present arrangement, as large quantities of goods, especially from the Continent, are delivered by shipping companies to the railway companies with huge charges all against the consignees. In many instances, these charges are 20 to 50 times more than that of the local railway charges, which are taken over and collected by the railways here, either on delivery of the goods or posted to consignee's monthly account. Shipping companies are credited or paid in course, and have no further concern in the matter. But the railway companies are saddled with all the trouble and expense, clerical and stationery, effecting clearances when disputes arise. This should cease, and, as already stated, the order of procedure regarding freight and carriage charges completely reversed. On the other hand, traffic from railway companies to shipping companies would all be delivered F.O.B. accompanied with mates' receipts or bills of lading, the shipping companies being at liberty to make their own arrangements as to who pays the freight. If senders pay, shipping companies should collect it themselves, but the railway companies might do so for them, if the

Digitized by Google

accounts made out in the name of senders (not the company) were sent them for that purpose.

Thus far but no further should the railway companies go in this matter. No attention or consideration should be paid to any objections and obstacles raised by shipping companies, agents (shipping or carting), traders, or any other interest whatever. The railways have in the past been altogether too complaisant in this regard; a legacy from the canvassing period of railway history when traffic was accepted with carriage charges anyhow to suit the mighty trader, "paid," "to pay," or "split up" part against both consignees and senders. For a time it seemed as if the railways were afraid to make a charge at all in case they gave offence. This is all a thing of the past. Although at present there are still anomalies, returned empties are invariably prepaid, but there are exceptions, *vide* Clearing House list of consignees who pay, notably, brewers, distillers, &c. This list falls to be cancelled; all empties must be prepaid in future. Let the railways settle and fix their own conditions of carriage, and all others concerned will require to make their arrangements accordingly--a gentle pressure of the iron hand in the velvet glove and the change is accomplished. What is there to fear?—nothing!

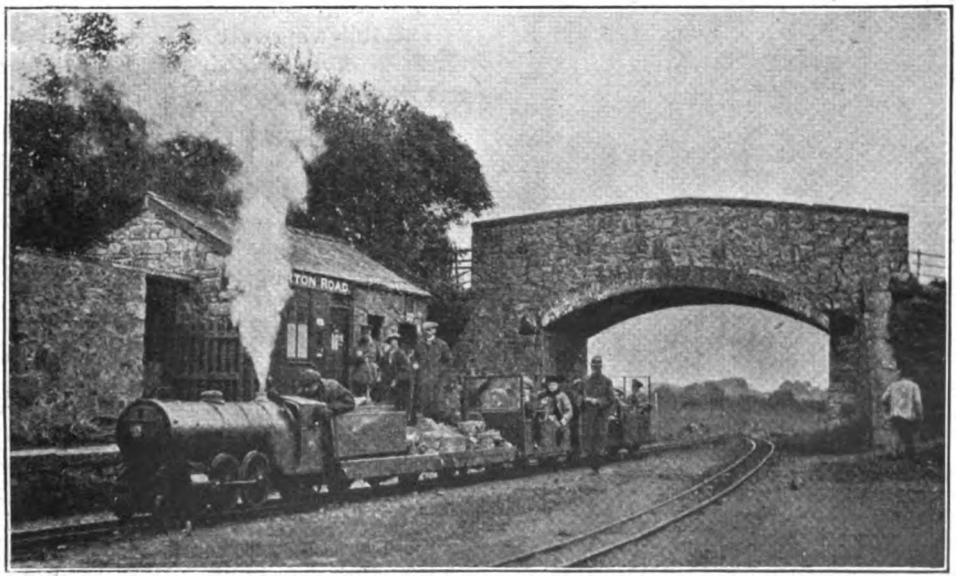
A large extension of "through rates" with shipping companies would solve many difficulties. Assuming the "prepaid" principle is in operation, all charges would, therefore, now be invoiced "paid," and the forwarding company becomes responsible for their collection and division by the Railway Clearing House. But to complete the principle and direct through one channel all charges to the forwarding company, the issue of "to pay" invoices, consisting mostly of "recharges," should be reduced to a minimum or stopped altogether, and this is possible with the following changes: First, charges for cartage on split consignments payable by senders should be included on the original invoice, sending stations being supplied with the rates of cartage at the other end; senders themselves detailing the separate deliveries on their shipping notes, or, alternatively, each consignment charged separately, the present arrangement being discontinued altogether; second, all packing, such as blocks, trestles, chains, &c., also padlocks used by the companies themselves for the security of goods during transit, and for which a charge is made between company and company, should cease. Guide invoices to be issued when such articles are used, and a perfect record kept of such, but no charge made. A notification should be embodied on the invoice that, if not returned to the owning company with 14 days, a debit charge invoice for value of the article would be passed against the receiving station after 21 days from the date of original invoice, and this condition would require to be inflexibly carried out. The object of allowing seven days longer before issuing the debit invoice is a margin to allow articles to arrive which have been despatched home within the proper time, but delayed in transit. The issue of many invoices would, therefore, be avoided, for the invoice once issued cannot be cleared or cancelled except by special authority from headquarters. For one invoice issued there would be thousands saved, and not invoices alone, but all the work involved, also stationery, &c., with possibly an extended correspondence, before the item was finally adjusted. The interests of both companies would be absolutely guaranteed; the one to return the article timeously and avoid accepting a debit, the other for value of same if lost. The carriage charges through the "prepaid" arrangements having now been concentrated, the whole of the revenue receipts are practically in the hands of the forwarding company. It follows, therefore, their abstracts and returns to the Clearing House would become all important, and for accountancy purposes are all that are necessary; they forming the basis—the main essentials—of the balance-sheet. The writer recommends the received abstracts and all relative returns should be discontinued forthwith. By this change, enormous economies are at once secured; indeed, it is doubtful if, in any reforms suggested, will the incidence of the economic change be so speedily realised. To discuss this aspect of the question fully would take up more space than we have at our disposal; sufficient to say that the advantages of the "received" abstracts as a check on the "forwarded" has gradually, yet

Digitized by Google

surely, been recognised to be of less and less importance. Under the "prepaid" system, with the whole of the charges (revenue) concentrated, the "received" forms would be practically useless. To continue to compile and check them as at present would, surely, be a work of supererogation. The object of these returns is to protect the interest of the receiving company, but it has been found and admitted by responsible officials this protection could be afforded by other effective means. All the safeguards required by the receiving company are invoices, issued by the forwarding company, for the traffic dealt with by them.

The risk of an invoice being issued, but not accounted for, is about equal to one in a million. It is no greater than exists in every department of work in which the human element forms a part. Every possible means should, of course, be taken to prevent such, but it is surely needless to maintain the present elaborate and costly system as a check for such small results. We expect, however, that on account of the work being simplified and reduced in volume, it would be more accurately performed by the station staffs in future than it has been in the past. In the interests of safety, we suggest a more frequent audit of station books, particular attention being given by the Inspectors to the checking of the invoices with senders' shipping notes, which should accompany every consignment of goods despatched; a check should also be made with the wagon record books and the invoices; these two checks would prove that all traffic has been invoiced. A further check should be placed on the forwarded abstracts—copy of which should be retained at the stations, or originals returned by the Clearing House—with the invoices, to prove in turn that all invoices have been properly accounted for; this is a *sine quâ non* in the interest of both, but especially the receiving company. This duty should be carefully performed, although not necessarily on every invoice issued between the visits of the Inspector, but it should be, in any case, an exhaustive and thorough test.

A NARROW-GAUGE RAILWAY SCENE.

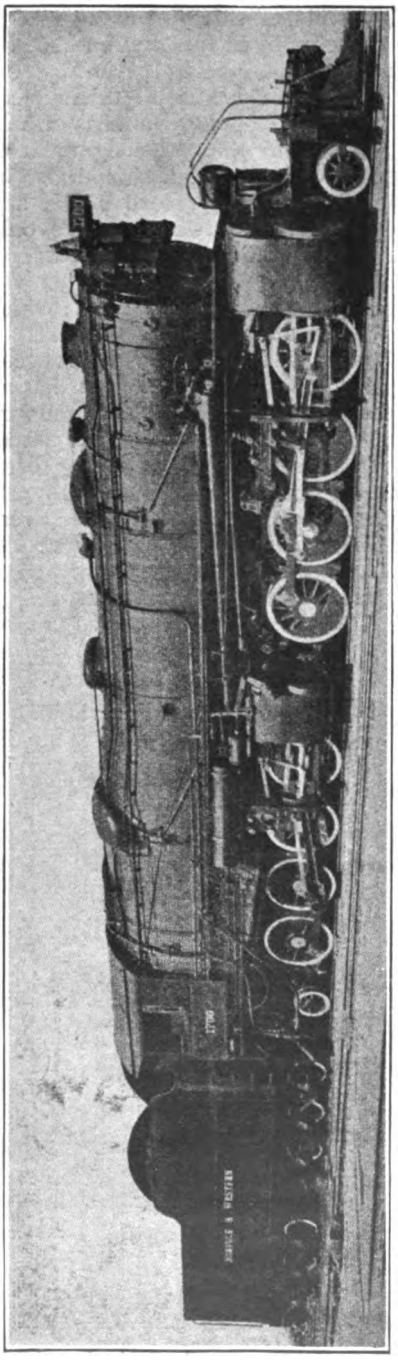


Photo] [*P. S. A. Berridge.*

RAVENGLASS AND ESKDALE RAILWAY.

Train at Irton Road Station.

Digitized by Google



NEW MALLET LOCOMOTIVE, NORFOLK AND WESTERN RAILWAY. WEIGHT, LOADED, 334 TONS COMPLETE WITH TENDER.

New Mallet Locomotive.

NORFOLK AND WESTERN RAILROAD.

THERE has recently been completed at the Norfolk and Western Railroad shops at Roanoke, U.S.A., the first of a new series of Mallet locomotives having 2-8-8-2 wheel arrangement. The design is the outcome of five years' observation of other Mallet locomotives already in service. The locomotive is built to practically fill the loading gauge dimensions, and with low pressure cylinders nearly 40 in. in diameter, the width at the front end is about 10 ft. The coupled wheels are equipped with flanged tyres throughout, and the locomotive is designed to take 18 deg. curves.

The following are the principal particulars of the locomotive :—Cylinders, L.P., diameter, 39 in.; cylinders, H.P., diameter, 24½ in.; piston stroke, 32 in.; coupled wheels, diameter, 4 ft. 8 in.; wheelbase—engine 57 ft. 4 in., engine and tender 92 ft. 11¼ in.; heating surfaces—firebox 482 sq. ft., tubes 5,834 sq. ft., total 6,316 sq. ft., superheater surface 1,510 sq. ft., grate area 96 sq. ft.; working pressure 230 lb. per sq. in.; adhesion weight, 210¾ tons; weight of engine alone, 267 tons approximately; weight of engine and tender loaded, 334 tons approximately.

The tender is carried upon two six-wheeled bogies. It has a water capacity of 12,000 U.S. gallons and a coal capacity of 20 tons.

Digitized by Google

The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Before asking for information concerning railway history and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," the twenty-first annual edition of which is on sale, price 5s. net, by post 5s. 6d. The book, however, is nearly out of print, and very few more copies are available. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

The Continental Loading Gauge.

The usual maximum height in the centre on British railways is 162 in. above rail level, but some run to 165 in. On the Continent it is 4,280 mm. (172.44 in.). The usual maximum width on British railways is 108 in., but on the Continent it is 3,100 mm. (122.05 in.). At 54 in. from the centre of the "four foot" the height at the side on British railways is of a maximum of 132 in., as compared with 4,000 mm. (157.48 in.) at 1,000 mm. (39.37 in.) from the centre, and 3,245 mm. (127.56 in.) at 1,550 mm. (61.02 in.). It will thus be seen that the Continental gauge is at least 10 in. higher than ours and 14 in. wider, one result of the latter factor being that the 6 ft. space between two pairs of rails would be encroached upon to the extent of 66 in., instead of 52 in. as now. The width at and below platform level is also greater on the Continent, which would not only affect the faces of platforms, but the height and width of many girders of under-bridges. The Board of Trade requirement that the distance columns and all structures are to be from the rail would need amendment. The dimensions of the Continental loading gauge given above are those determined by the International Commission of the *Unité technique des Chemins de fer* at its third Congress on May 18th, 1907, when there were present representatives from the Governments of Germany, Austria, Hungary, Belgium, Bulgaria, Denmark, France, Italy, Norway, Holland, Roumania, Sweden and Switzerland. It is this body which secures uniformity in all the rolling stock exchanged on the Continent; determining the dimensions of the loading gauge, the maximum length of vehicles and the maximum axle load. It also fixes the position of couplings, continuous brake and steam-heating pipes, of the connecting gangeways of vestibuled coaches, &c. Thus may be learned the meaning of the term, "international equipment," occasionally met with, *e.g.*, in the descriptions of ambulance trains built in Great Britain for use on the Continent. Dealing with this subject recently, the *Railway Gazette* remarked:—"During the revelations of the last four years we have occasionally wondered whether Germany had any hand in the establishment of this commission, and the securing of uniformity of rolling stock; whether it was part of the machinations of the Kaiser's Government which had, as an ulterior motive, the desire to be able to move vehicles anywhere. We think, however, that we may dismiss such an idea, as the proposals emanated originally from Switzerland in 1882."

[Reply to "TELEPHONE CALL."]

Broad Gauge Locomotive, *North Star.*

This famous engine was illustrated and described in the RAILWAY MAGAZINE, April, 1906, but the part has long been out of print. The *North Star* was built by R. Stephenson and Co., Newcastle, in 1836, for a foreign railway with a gauge of 6 ft., and Daniel Gooch, who was at that time employed at Stephenson's works, signed the drawings. For financial reasons, the *North Star* was not delivered to the line for which she was originally built, but was altered for use on the 7-ft. gauge, and sold to the Great

Digitized by Google

Western Railway. She was a 6-wheel "single" engine. Her driving wheels were 7 ft. diameter; cylinders, 16 in. diameter by 16 in. stroke (afterwards increased to 18 in. stroke); heating surface, 724 sq. ft.; grate area, 13 sq. ft.; weight of engine and tender loaded, 28 tons. During a series of trials with the other early broad gauge locomotives, the *North Star* was found to be the best of seven engines. With a train weighing 40½ tons (69 tons including engine and tender) she ran 8,848 miles, at an average speed of 25.45 miles an hour, the coke consumed amounting to 47½ lb. per mile. The *North Star* began work on the Great Western Railway, January 1st, 1838, and was withdrawn from service in December, 1870, after running 429,000 miles. She was preserved for many years, and was exhibited at Earl's Court in 1897, and much regret was expressed in many quarters when nine years afterwards this historic locomotive was dismembered.

[Reply to R. V. G.]

Slip Coaches.

So far as we are aware, the practice of diverting an express from a fast line to a platform line in order to slip coaches has been one confined to the G.W.R., in particular at Reading, on the up journey, and Leamington, on the down journey. Doubtless the reason is in order to save obstructing the main line with the slip coach, and also to economise engine power and signal and switch movements in drawing the coach to the platform, in addition to giving the slip coach an earlier arrival at the station. The more general method, however, in the case of stations with platform roads and fast centre roads, is that of slipping on the main line, and then drawing the coach to the platform, as practised hitherto at Coventry, L. and N.W.R.; Doncaster, G.N.R.; Ashford, S.E. and C.R.; and elsewhere. These conditions do not arise at Bletchley, to which station you refer in your letter.

[Reply to "A REGULAR SUBSCRIBER."]

"Birdcages" in Guards' Brakes.

More extensive use is made on the S.E. and C.R. than on any other system of the "birdcage" or raised roof for guards' brakes, although the same type of roof is found on the passenger brake-vans of the North London Railway, a few suburban stock brakes on the G.N.R., "slip" brakes on the L. and N.W.R., and the majority of the goods brakes on the N.E.R. The principal advantage of this type of construction is that it affords the rear guard of a train a better look-out in the direction of running than the projecting side windows, but the high elliptical roofs of the present day, of course, render this type of construction impossible.

[Reply to W. E. SYDAL.]

"Sir Gilbert Claughton" *versus* "Lord Faringdon."

See reply to Thomas Walne in August RAILWAY MAGAZINE. The dimensions of G.C. engines *Lord Faringdon* and *Sir Sam* Fay are practically identical, saving only the use of four cylinders in the former in place of two in the latter. Questions of such a type as "Which express passenger engine is the strongest and can attain the greatest speed with a given load when running a distance of 150 miles?" are practically impossible of answer, as we have often pointed out, and we may further add that these columns are intended to give statements of fact rather than expressions of opinion.

[Reply to J. RADCLIFFE.]

A Yorkshire Line.

The railway from Goathland to Beck Hole is a portion of the original route between Whitby and Pickering, and it was disused upon the opening of the present-day line or deviation in July, 1865. The metals now run upon a gradually rising gradient for about the distance of a mile, and stop at a point where the Murk Esk was crossed by a bridge. In 1908 a service of autocars between Whitby and Beck Hole was introduced for the summer months only—five each way daily. These are, of course, now withdrawn, but mineral trains still work over the branch.

[Reply to "YELVERTOVIAN."]

The Johnson 4-4-0 Compounds, Midland Railway.

No. 2634 was the original numbering of one of the five 3-cylinder 4-4-0 compound engines designed by Mr. S. W. Johnson for the Midland Railway. These engines were supplied with eight-wheeled tenders at the time of their construction. They are now numbered 1000-1004 inclusive, have been rebuilt to conform externally to the remainder of the com-

Digitized by Google

pounds, and fitted with superheaters, and their bogie tenders have been replaced by the standard six-wheeled variety.

[Reply to A. L. ROTHERHAM.]

Portsmouth Town Station.

There are two stations at Portsmouth Town; these are adjacent to one another, the High Level being used by trains to and from the Harbour Station, and the Low Level being terminal for passenger trains, although communication is afforded on the Low Level to the Dockyard lines. It would obviously be impossible to publish an article of the scope desired by you at the present time, although it may be feasible to do so after the war.

[Reply to J. D. THOMSON.]

"Atlantic" No. 1300, Great Northern Railway.

No. 1300 was built as a 4-cylinder compound by the Vulcan Foundry Co., but has recently been rebuilt by Mr. Gresley with two outside cylinders, 20 in. diameter by 26 in. stroke, with piston valves on top. Full details of the conversion and illustrations of the engine before and after this took place appeared in the RAILWAY MAGAZINE of January, 1918, copies of which are still available.

[Reply to W. R. P.]

Didcot Junction.

You do not specify to which particular connections at Didcot you refer, but we assume that you mean the Northern loop from Didcot East Junction towards Oxford, used by non-stopping trains for the Oxford direction. The restriction for down trains is 40 m.p.h. from the main lines and 35 m.p.h. from the relief lines, and for up trains 40 m.p.h. to the relief lines and 35 m.p.h. to the main lines.

[Reply to "A REGULAR SUBSCRIBER."]

The Fastest Great Western Railway Schedules.

At present the fastest booked run on the G.W.R. is made by the 11.0 a.m. West of England expresses, *ex*-Paddington, which cover the 106.9 miles to Bath in 118 min., average 54.4 m.p.h. This is closely approached by the 4.0 and 6.30 p.m. expresses over the same route, which cover the 94 miles to Chippenham in 104 min., average 54.2 m.p.h.

[Reply to J. TALBOT.]

London, Brighton and South Coast Railway Locomotives.

There are five 2-6-0 express goods engines on this railway, numbered from 337 to 341 inclusive. The latest type of engine turned out of Brighton works is the 4-6-4 "Charles C. Macrae" express tank class, as the subsequent 105 series of 0-6-0 tank engines of 1915 are practically identical with the E2 class of 1913.

[Reply to M. J. BIZERAY.]

Great Central Railway Locomotives.

You are by no means clear whether you refer to tender or tank locomotives. Presumably the latter, as 4-4-2 tank engines working in the London area have all been transferred to the Manchester, Sheffield, and other districts, and replaced by the more powerful superheater 4-6-2 engines.

[Reply to G. H. W.]

Carlisle.

Your query, which is very indefinite, would take more space to answer adequately than we can afford; you should consult articles which have appeared in past issues of the RAILWAY MAGAZINE concerning this notable railway centre, or else propound some more specific questions.

[Reply to J. D'AOUT.]

Midland Railway Locomotives.

There is no reason why 4-4-2 or 4-6-0 engines should not be run on the Midland Railway, but only the locomotive authorities of the line in question can say why such types are not run. Presuming the present 4-4-0 types fulfil the requirements of the company satisfactorily, there is, in fact, nothing further to be said.

[Reply to G. C. CHAPMAN.]

West Coast Joint Stock.

The special 12-wheeled vehicles built to work on the 2.0 p.m. express from Euston to Glasgow, Edinburgh and Aberdeen and the corresponding up train are still employed on this service, although the trains concerned now start one hour earlier than previously.

[Reply to J. B. B.]

Speed Indicators.

It is not the practice in Great Britain to fit locomotives with speed indicators, although this has been done in one or two experimental cases. We believe the

Digitized by Google

rumour you mention to be correct, although details of the engines now building are not yet available.

[Reply to R. S. TAGGART.]

Metropolitan Railway Electric Trains.

Latest six-car trains on this line are equipped with eight 215 H.P. motors, 1,720 H.P. to a complete train. One of these trains at starting up on the level would develop about 35 per cent. overload, and at normal full speed on the level 45 per cent. of full load.

[Reply to "ELECTRA."]

Early Johnson 4-4-0 Engines on the Midland Railway.

Last published figures of the early 4-4-0 engines of Johnson's design on the Midland Railway still unrebuilt gave the number as 300 to 327 inclusive, but we believe that at least one-half of these have since been scrapped.

[Reply to A. R. COWLISHAW.]

London and North-Western Railway "Consolidations."

2-8-0 engines on the L. and N.W.R. have in all cases been converted from Webb's 4-cylinder compound 0-8-0 goods engines of 1901 and subsequently, and retain their compound working in cases where so rebuilt.

[Reply to J. L. WILLOUGHBY.]

Great Central Railway Gradients.

From Canfield Place Box up to West Hampstead Station there is a 1 in 100 gradient, and from there, after a short stretch at 1 in 287 through the station, the grade up to the point where the L. and N.W.R. is crossed, is one of 1 in 87.

[Reply to R. WHEATLEY.]

Light Railways in Essex.

The line from Kelvedon to the mouth of the River Blackwater was the first light railway in Essex. It was illustrated and described in the RAILWAY MAGAZINE, November, 1904, shortly after the opening of the line.

[Reply to J. FORD.]

Some Underground Queries.

Nothing has been done in the matter of extending the G.N.P. and B. Railway to Ravenscourt Park. It is useless for us to prophesy as to what extensions of the Underground lines will take place after the war.

[Reply to J. H. SEWELL.]

Northampton and Market Harboro' Branch, London and North-Western Railway.

Length of both up and down line tunnels at Kelmarsh is 524 yards. Length of the down line tunnel at Clipstone is 463 yards, and the up line tunnel 453 yards.

[Reply to J. T. SAUNDERS.]

The Great Western Railway and Aylesbury.

Through Great Western trains are run from Paddington to Aylesbury, both direct *via* the G.W. and G.C. Joint Line, and also *via* Maidenhead, High Wycombe, and Princes Risborough.

[Reply to G. H. W.]

New 4-6-0 Superheated Goods Locomotives, Highland Railway.

We are officially informed that the new engines are doing excellent work hauling heavy loads, and they are economical in the consumption of coal and water.

[Reply to ANDREW KEITH.]

Vacuum Ejectors.

It is probable that the noise is caused by the vacuum ejector, which in these and other G.W. locomotive types is worked off the crosshead.

[Reply to H. G. CLEMENT.]

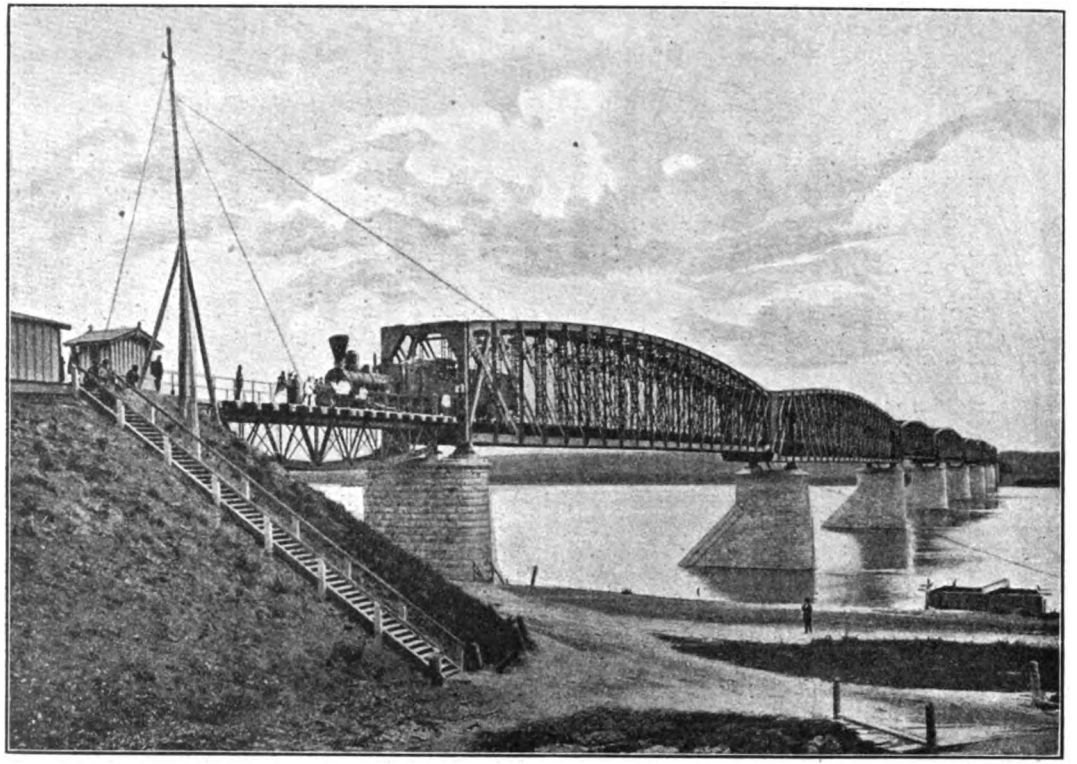
Train Rear Lights.

See page 339, "Railway Year Book," 1918.

[Reply to H. P. FILBY.]

Digitized by Google

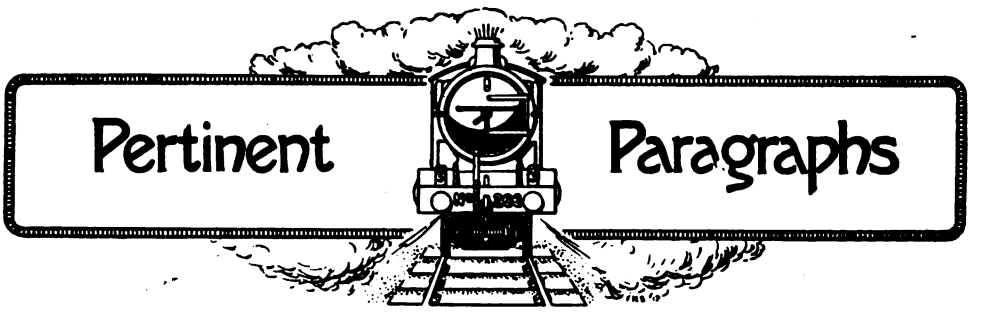
A SCENE ON THE SIBERIAN RAILWAY.



RAILWAY BRIDGE (863 YARDS LONG) ACROSS THE RIVER OB.

(By the courtesy of Messrs. R. Martens and Co., Ltd., 149, Leadenhall Street, E.C.3, publishers of the sixpenny monthly "Russia.")

Digitized by Google



0-6-0 Passenger Tank Engines on the Great Eastern Railway.

MR. J. F. GAIRNS, now serving with a section of the Railway Troops working in England, writes in reference to these engines necessarily dealt with very briefly by Mr. Ahrons: — "Being away from access to works of reference, I may overstep the date limits imposed upon himself by Mr. Ahrons, but I believe I am correct in stating that a considerable number of these engines—0-6-0 condensing passenger class—were engaged in working the Liverpool Street-Chingford, Enfield and Palace Gates services long before the nineteenth century closed. They had become, indeed, the standard engines for those routes, having been introduced expressly in view of the numerous stops to be made at stations close together, requiring rapid accelerative powers. Possessing characteristics somewhat akin to the well-known Brighton 'Terriers,' they were bigger engines; but they had to take considerable loads and climb some steep grades, notably that at 1 in 77 from Bishopsgate to Bethnal Green. For working 15-coach trains, albeit four-wheelers, loaded to full capacity, they were, however, small engines; yet many of the original ones, except for higher-pressure boilers, are still engaged on the same trains, increased to 17 four-wheelers or occasionally 8 bogies. Equipped with Westinghouse brake apparatus, condensing fittings (in view of their working through the enclosed suburban lines at Bishopsgate), and painted blue, they were otherwise virtually the same as the goods engines of the same period. Frequently, too, they worked on other services to and from both Liverpool Street and Fenchurch Street; and it was by no means unusual for them to perform a degree of reasonably fast working. I have often seen them, or travelled behind them, doing 35-40 m.p.h. with full loads, despite their 4 ft. wheels. They have often done even better, quite up to 50 m.p.h., though that was, of course, exceptional.

"The small class referred to by Mr. Ahrons have never, to my knowledge, worked in London except on the Fenchurch Street-Blackwall trains. For some years those on that duty have had the leading coupling rods removed, converting them to the 2-4-0 type. Any 0-6-0 tank engines seen at Fenchurch Street on other trains would always be of the general passenger class before referred to. Remaining small-class engines are to be found on lighter country branch lines. Writing from memory, most of the condensing engines were numbered round about 350 and 260, while the small class were numbers 150-159 and 240-259. More recently the condensers have been fitted with higher-pressure boilers, while recent additions are Nos. 50-59 and 80-89, with Nos. 40-49 having new style chimneys and side-window cabs. As a class they now do frequent goods working, but they are still the usual engines for the routes above mentioned."

2-4-2 Tank Engines.

OUR correspondent also refers to these engines, amplifying Mr. Ahrons' remarks: "Of the Worsdell original thirty, No. 674 always had link motion, and as far as I could observe the others of the 650-679 series were much improved when the Joy gear was removed, notwithstanding the fine results which that gear has given on other railways, notably the L. and N.W.R. and L. and Y.R. Personally I always preferred the 791-800 series built by Mr. Holden, otherwise corresponding except for valve gear. These ten have long been Nos. 790-799, No. 800 being renumbered 790. It is interesting to note that several of the 650 series are still employed on the heavy London traffic. Also that some of the N.E.R. engines of corresponding design bear the same numbers as their G.E.R. prototypes.

"At intervals successive series of engines to the same design, with no noticeable differences, have been turned out, the order being, I believe, 780-789, 140-149, 70-79, 90-109, 170-179, 220-239, 570-599. Some of these, principally in the series 780-789, 140-149, and 90-109, have been rebuilt with higher-pressure boilers, new chimneys, and a few with side-window cabs. Nos. 60-69 and 1-10 were built new to the complete modified design. Originally—and this was, I believe, before the close of the nineteenth century—Nos. 780-789 and 140-149 were built and used exclusively as country branch engines, and did not appear in London until rebuilt as above mentioned, when they replaced the large 1090 class. The

Digitized by Google

other series worked in London, replacing the old Bromley and Adams 0-4-4 tank engines of the same numbers. So closely did this occur that I remember travelling behind No. 0177 (Bromley 0-4-4), and a fortnight after on the same train with No. 177, while a somewhat analogous instance occurred with Nos. 077 and the new 77. The coincidence of 77's is rather curious, but similar possibilities could and did occur with other engines, though actual instances have not impressed themselves on memory. Many of these engines, together with some of the Worsdell's, are still engaged in London traffic side by side with the rebuilds and the No. 1 class; but I have not seen Nos. 790-799 for several years in London. These and engines from most of the other series are also largely used on branch lines.

"The 1090 class, with 5 ft. 8 in. coupled wheels, were altogether bigger engines, corresponding, in fact, to the 420 class of mixed-traffic tender locomotives. They did a good deal of suburban traffic side by side with the smaller engines, but also made longer journeys, to Southend and other destinations 40 or 50 miles out, frequently doing some really fast work. In order of coming out, commencing in 1893, the numbers are: 1090-1099, 1080-1089, 1070-1079, 1060-1069, and 1040-1049, a somewhat peculiar order, but one which has been paralleled several times in G.E.R. practice. None of these big tank engines are now regularly on London duty, the smaller 2-4-2 tanks taking even the longer and faster tank engine runs, but a few work into London from sheds 40 to 50 miles out. Most are engaged on the more important branches, such as those radiating from Norwich."

London and North-Western Railway Locomotives.

UNDER the caption "Railway Literature," Mr. C. Williams' supplementary list of L. and N.W. locomotives was noticed in the September RAILWAY MAGAZINE, and in regard to some of the points raised in the review Mr. Williams writes from 78, Chetwode Street, Crewe, as follows:—

It should be understood that where no differences occur the same are as given in the 1912 list. Hence the three superheated "Precursors" referred to—viz., Nos. 302, 323, and 1309—have still 19 in. cylinders, as shown in the previous list. The nine orginal "George the Fifths," including 2663, still retain the 20 in. cylinders. As regards the ten "Queen Marys," now included in the "George the Fifth" class, these were not given new cylinders on conversion, the same being then bored out to 20 in. The suggestion re fuller dimensions being given in tabulated form will be considered in relation to the next edition. I regret you were not asked, when speaking of the new list, to mention that copies of the original 1912 edition were still obtainable at 1s. 7½d. each, post free.

In response to inquiries from several RAILWAY MAGAZINE readers I append a list of the twenty-seven "Claughton" class locomotives which have been turned out temporarily without names—viz.: Nos. 116, 159, 162, 171, 186, 713, 986, 1019, 1085, 1103, 1334, 1335, 2042, 2097, 2122, 2230, 2366, 2368, 2373, 2411, 2416, 2420, 2426, 2427, 2431, 2445, and 2450.

Two Big Railroad Men.

LORD SHAUGHNESSY, a few weeks before the announcement of his retirement from the position of President of the Canadian Pacific Railway, issued the following circular:—

"Mr. Geo. M. Bosworth, Vice-President of the Company, will retire Sept. 1st, proximo, to become Chairman of the Canadian Pacific Ocean Services, Limited, and the Directors have appointed Mr. William R. MacInnes, Vice-President, to succeed him.

"Mr. MacInnes will have charge of all matters connected with the Company's Traffic Department, and will perform such other duties as may be assigned to him.

"(Signed) SHAUGHNESSY,
"President and Chairman."

The new position occupied by Mr. George M. Bosworth is a natural result of the growth of the shipping interests of the Canadian Pacific system, which has now in its owned and chartered ships one of the largest mercantile fleets operated by any single corporation, a fleet which is actually greater to-day than it was at the outbreak of war. So great, indeed, have these shipping interests become that they could no longer be considered a side issue, and Mr. Bosworth, according to an announcement of the directors of the C.P.R., will henceforth devote the whole of his time to this important branch of this great transportation system.

William R. MacInnes, who has been appointed Vice-President of the Canadian Pacific Railway, in charge of traffic, is a son of the late Senator Donald MacInnes, and Mary Amelia, daughter of Sir John Beverly Robinson, Bart., C.B., and was born in Hamilton, Ont., on June 7th, 1867. Senator MacInnes was for many years a director of the Canadian Pacific Railway, and was closely identified with its inception and growth. Educated at private schools and at Marlborough College, one of the leading public schools in England, Mr. W. R. MacInnes returned to Canada to enter the service of the Canadian Pacific Railway as a clerk in the Purchasing Department. Since that time he was consecutively appointed: Solicitor's office, 1885-1886; general traffic manager's office, 1886-1887; chief clerk to general traffic manager, 1887-1896; general agent, freight department, Canadian Pacific Railway, and agent, Canadian Pacific despatch, Chicago, Ill., 1896 to 1899; during same period he also represented

Digitized by Google

Minneapolis, St. Paul, and Sault Ste. Marie Railway, and Duluth, South Shore, and Atlantic Railway; general freight agent lines west of Lake Superior, 1899 to 1901; assistant freight traffic manager western lines, 1901 to 1903. On Jan. 1st, 1903, he was appointed freight traffic manager of the C.P.R. His election as President of the Canadian Freight Association followed two years later, and in all matters pertaining to traffic on the North American Continent his high ability has been widely recognised.

He is a member of the Mount Royal, St. James', Forest and Stream, Montreal Hunt, Back River Polo, Montreal Jockey, Montreal Racquet, Royal Montreal Golf, Winter, Toronto (Toronto, Ont.), and the Manitoba (of Winnipeg) Clubs, and is also a member of the Art Association Society of Montreal.

In October, 1916, the Bank of British North America created a Canadian Advisory Committee, consisting of three members, one of whom is Mr. MacInnes, the other members being Sir Herbert B. Ames and W. R. Miller.

Mr. Geo. M. Bosworth was born at Ogdensburg on January 27th, 1858, and he was educated there. He entered the railway service of the Ogdensburg and Lake Champlain Railway in 1875, becoming Greneral Freight Agent of that road in 1881. In 1882 he joined the Canadian Pacific Railway as Assistant General Freight Agent of the Ontario and Quebec Lines. After various promotions he became Freight Traffic Manager of the entire system, and in December, 1901, was appointed fourth Vice-President of the Company.

He took a particularly active part in the building up of the shipping interests of the company, and on the formation of the Canadian Pacific Ocean Services, Limited, took charge of that subsidiary company, of which he is now appointed Chairman. Mr. Bosworth is a Director of La Banque Provinciale, the Dominion Dry Dock Company, and the Crown Trust Company.

He is also a member of St. James' Club, the Canada Club, the Montreal Hunt Club, the Royal St. Lawrence Yacht Club, the Lachine Boating Club, the Canadian Camp Club, N.Y., and the Century Club, Ogdensburg, N.Y.

Recent Railway Bills before Parliament.

FROM the railway standpoint the past Parliamentary session has been remarkable, in that none of the leading English railways deposited a bill, a fact unparalleled since the early days of railway legislation. There was only one private railway promotion—viz., the Canvey Deep Water Wharf and Railway Bill—and this was rejected early in July. Certain light railway powers have, of course, been applied for during the year. Whilst there was this absence of railway bills in England, there were three railway promotions in Scotland and Ireland—viz., the order promoted by the Glasgow and South-Western Railway, and the bills of the Londonderry and Lough Swilly and the Dublin and South-Eastern Railways. Some very small widenings and extensions were proposed in the first two named of these applications, whilst in the Dublin and South-Eastern Bill a deviation of the existing line between Bray and Wicklow was proposed, the length thereof being some 10¾ miles.

As already indicated, the Canvey Island scheme was the only English railway proposal. The powers sought were for the incorporation of a company and the construction thereby of a wharf and other works on the south side of Canvey Island near the mouth of the Thames, and of a railway 5 miles in length to connect the same with the Midland Railway system at Pitsea Junction on the London, Tilbury, and Southend section. The bill met with strong opposition from the Port of London Authority, and also from the Midland Railway, and it was rejected by Lord Ribblesdale's Committee early in July. The wharf, which was to have been 3,000 ft. long, was to cost nearly £500,000, and was to be constructed so as to accommodate the largest classes of vessels at all states of tide. The railway was estimated to cost about £250,000, and the total capital powers sought were for £805,000.

The grounds of rejection of this bill were financial rather than the merits of the scheme itself. The proposal to develop the island was, in fact, made very many years ago, and latterly, in 1912, a bill was promoted to secure sanction for a scheme somewhat similar to that recently rejected, but it failed to receive sanction. The proposal at that time was to construct a line leaving the existing railway at Benfleet Station, which would have involved a shorter length of railway than would the recent proposal, but an increased expenditure in crossing the waterway known as Benfleet Creek, which runs along the northern side of the island. The geographical situation of the island, it is claimed, lends itself to some such scheme of development as proposed in these bills, and there is good reason to suppose that the project will in some form or another again be brought forward.

Shunting by Signs at Nine Elms

IN the book of rules issued by the London and South Western Railway to the staff quite a number of the instructions relate to shunting. At some places, however, these instructions have to be supplemented to suit the local conditions. Nine Elms is a case in point. At this important station, with its thousands of wagon and engine movements daily, the usual method of transmitting orders by loud shouting from one man to another would be chaotic. It has, therefore, been abolished, and instead there has been adopted a system of signalling by signs, invented by

Digitized by Google

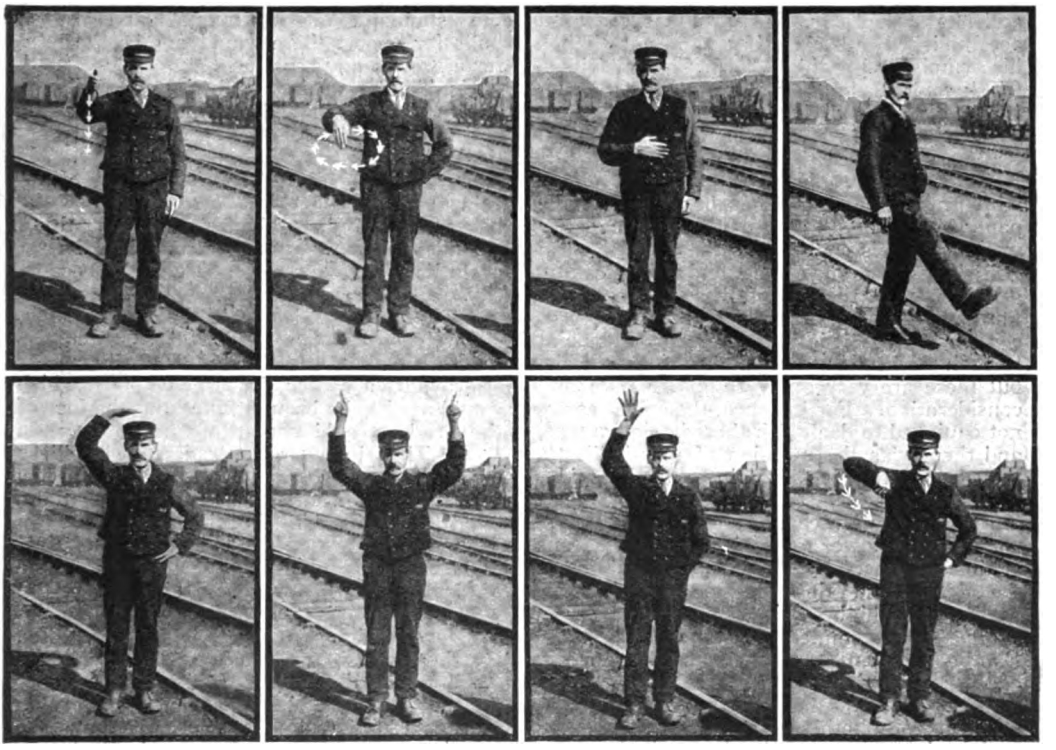
the staff, for both day and night working. The uninitiated visiting Nine Elms might be somewhat astonished to find one shunter vigorously patting his stomach, another standing on his left leg carefully raising his right, a third apparently indulging in a "thumbs up" demonstration. These actions are, however, merely some of the signs by which the shunting of such a large, intricate, and busy yard is efficiently conducted. The accompanying illustrations show a number of the silent shunting signs employed. The shunter is shown indicating to the signalman in B Yard Box the particular road to which he requires to shunt a draft of wagons. The signalman without any further instruction operates the points, and the movement is carried out; no noise, no confusion.

Straight Road.
By Day.—Right hand moved up and down.
By Night.—White light moved up and down.

Loop Road.
By Day.—Right hand moved in a circle.
By Night.—White light waved in like manner.

Empty Road.
By Day.—Patting of stomach by right hand.
By Night.—Red light moved up and down.

Coming Out Road.
By Day.—Raising of right leg.
By Night.—Green light moved forward.



SIGNS IN USE AT NINE ELMS FOR SHUNTING TO THE ROADS SPECIFIED.

Table Road.
By Day.—Right hand passed over the head.
By Night.—White light raised above head.

No. 2 Road.
By Day.—Raising one finger of each hand.
By Night.—Green light thrown to left of body.

No. 5 Road.
By Day.—Raising of right hand open.
By Night.—Green light moved up and down.

Hay Road.
By Day.—Right elbow moved up and down.
By Night.—Green light moved in a circle.

Institution of Locomotive Engineers, Northern Centre.

AT a recent meeting of the Northern Centre of the Institution of Locomotive Engineers held at Leeds, Colonel Kitson Clark presiding, Mr. H. Kelway-Bamber's paper on "Coal and Mineral Traffic on the Railways of the United Kingdom" was under consideration.

Mr. Kelway-Bamber explained his object in writing the paper, which had already been discussed in London, but he hoped the present discussion would throw still further light on the question of the use of high capacity wagons in this country after the war.

He pointed out that unless everybody in this country works at 95 per cent. to 100 per cent. of what is possible, the country is going

Digitized by Google

to have a very poor look in as regards industry, and certainly from a railway point of view, the railway shareholders will see no dividend. Mr. Kelway-Bamber had, therefore, cast about to see what was being done in other countries, and as a result was able to lay the facts enumerated in his paper before the members of the Institution and railway people generally.

Colonel Kitson Clark opened the discussion by proposing a vote of thanks to Mr. Kelway-Bamber for the admirable manner in which the facts and figures contained in the lecture had been marshalled and put before the members. He discussed the question of axle loads, and pointed out that the lecturer had understated, if anything, the possible loads, and he asked Mr. Kelway-Bamber, as an accomplished musician, if he had not pitched his symphony in a high key. Colonel Kitson Clark and the lecturer had also a discussion on permissible axle loads.

Mr. J. R. Bazin, of the Great Northern Railway, seconded the vote of thanks to Mr. Kelway-Bamber. He was unable to agree with everything which has been said in the paper regarding the use of high capacity wagons in this country, as the conditions on British railways have been, and are still, altogether against the use of these wagons. So far as the actual running of a train is concerned, he said, it is, of course, a great point to make the paying load as large as possible, but there are very many things to take into consideration. For instance, the collieries are not equipped to deal with these bogie wagons, and there was the question of marshalling a mixed train to be taken into consideration. The fact to be noted would be the effect of marshalling high capacity wagons amongst wagons of lower capacity—say, 40 tons against 10 tons. Also with coal for shipment, the docks and tips are not suitable for dealing with high capacity wagons.

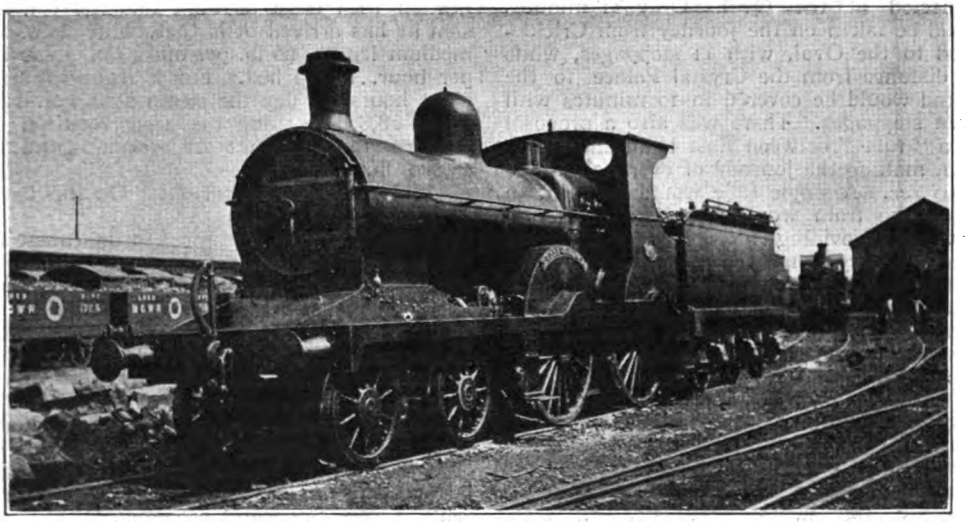
Mr. Bazin commented upon Mr. Kelway-Bamber's statement that about 66 per cent. of the coal carried on our railways is for home consumption, and believed he was right in saying that something like 86 per cent. of the coal for home consumption is required in very small consignments of under 20 tons. It seems no great point would be gained by using wagons of 40 or 45 tons capacity when the load would have to be divided amongst perhaps two or more coal merchants. The question of repairs must also be taken into consideration. The repair shops hardly know which way to turn on account of the number of wagons for repairs. All railway companies are not equipped at their out-stations for dealing with wagons of large capacity, and it would probably mean an expensive plant and extra accommodation being provided than we have at present. Mr. Bazin spoke at some length about the common-user arrangement, the question of automatic brakes, and the large extra number of spare parts which would require to be sent about the country. In certain cases under war conditions wagons are being run longer distances, and are carrying larger consignments of coal, and under these circumstances wagons of 20 tons capacity are being used with great advantage, but it is very necessary to keep the trains intact.

Mr. Spencer, Leeds, raised the question of corrosion, and pointed out that the great trouble in this country has always been corrosion, especially of steel underframes, the life of which is very short. Axleboxes would also require a good deal of attention, and a few remarks by Mr. Kelway-Bamber on axleboxes would, no doubt, be appreciated. If the workmanship on high capacity wagons was up to the standard of workmanship on wagons built for export there would not be the need for a great many repairs.

Mr. Thorpe, of the North Eastern Railway, York, said he would leave the technical side entirely, and would only speak of the practical side from the traffic point of view. He appreciated the difficulties in the way of developments of the kind mentioned in the paper under discussion. The whole thing should be a question not of revolution, but of evolution. Of course, the use of high capacity wagons would mean that only one wagon would have to be dealt with in place of, say, four. There was a good deal in what Mr. Bazin said about marshalling trucks by means of gravitation, which, for large wagons, which would need to be brought to rest at the foot of the grade, would necessitate an increase in staff. Then in regard to traders and colliery owners, you must carry them with you. They should have consideration, as at present there is no trader capable of dealing with a 40-ton wagon. The present weighbridges, coal tips, cranes, and general equipment is incapable of dealing with anything above a 12-ton wagon. There is, however, a practical opening for development in the mineral traffic. By the exclusive use of large wagons the small man will be thrown into the hands of the middleman, which is a very undersirable process. At the same time progress must be our aim; we cannot afford to stand still. Looking into the future and the great possible developments, one welcomes every effort to develop the wagons and increase the transit power of the railways. Mr. Thorpe concluded by saying that Mr. Bamber had stated his case most lucidly, and in no case overstated his figures, which are reasonable and generous, and he felt he had profited by what he had heard.

Mr. Paterson, of the Lancashire and Yorkshire Railway, Low Moor, spoke from the locomotive man's point of view. He was of the opinion that the next ten years would see a very marked progress towards the ideal. He mentioned the effect on the acceleration of trains due to the reduction in train length, which would follow the adoption of high

Digitized by Google



Photo] [*J. Macartney Robbins.*

MIDLAND GREAT WESTERN RAILWAY.

4-4-0 Faugh-a-Ballagh class locomotive, No. 4, *Ballynahinch*, at Broadstone waiting to proceed to North Wall for the 5 10 p.m. goods train.

capacity wagons. On the Lancashire and Yorkshire Railway there were a large number of high capacity wagons running, which would be increased in number if the private owner difficulty were not in the way. As a means of overcoming the small trader difficulty, Mr. Paterson instanced the use of separate "flats" used in Lancashire for the carriage of goods belonging to different firms, and often a wagon contained a number of these "flats," which could be loaded and unloaded conveniently. He was of the opinion that something might be done in this way to meet the small trader difficulty. There was also the possibility of carrying two vehicles on three bogies.

Mr. J. S. Elliott, of the Lancashire and Yorkshire Railway, Goole, thought the matter of these wagons being mixed with lighter vehicles in transit had been missed. The braking necessary to stop large wagons is a point which certainly should not be lost sight of. He was of the opinion that the greater portion of the distribution of household coal is done in small lots, and, therefore, cannot be dealt with in large wagons. What is required is a good first-class standard 12-ton wagon.

Mr. A. T. Houldcroft mentioned various experiences in India in dealing with the question of repairs to high capacity wagons. He also gave figures showing how the use of large wagons has increased in other countries, and advocated the wholesale scrapping of all facilities which at present impeded progress in this country. The use of high capacity wagons, he stated, would in a very short time amply repay the cost of their installation, and also of the scrapping process which he advocated so strenuously.

Mr. Kelway-Bamber replied to the various points raised in the discussion, and instanced the practice current in India in the use of high capacity wagons. Preceding and following the discussion a number of lantern slides were shown illustrating various types of Indian and South African wagons, and the methods used in India for unloading and loading coal from wagons into the holds of vessels.

Tube Railways of the Future.

THERE was a goodly gathering at the October general meeting of the members of the Railway Club, 92, Victoria Street, S.W.1, when Mr. Chalmers Kearney lectured on "Tube Railways of the Future." Mr. W. Parker presided, and among those present were Lord Headley, Mr. R. W. A. Salter, Mr. F. H. Stingemore, Mr. Basil Mercer, and Mr. H. L. Hopwood, whose names are well known to RAILWAY MAGAZINE readers. In the absence of Mr. Edwin J. Miller, the secretarial duties were performed by Mr. M. D. Greville; the lantern and slides used to illustrate Mr. Kearney's remarks were operated by Mr. A. W. Bartlett.

In the course of his lecture, which was followed by an animated debate, Mr. Kearney informed his audience that surveys had recently been made for the construction of two high-speed "tube" railways, one from the Crystal Palace to the Strand, and the other from the Oval to Cricklewood. The two tubes (run mainly by gravity) would be

Digitized by Google

connected at the Oval. Only 12 minutes would be taken on the journey from Cricklewood to the Oval, with 11 stoppages, while the distance from the Crystal Palace to the Strand would be covered in 10 minutes with seven stoppages. There was also a proposal for a "tube" between East Ham and Woolwich, making the journey of over half-a-mile in 50 sec. A single tube would be built, in which one train would run backwards and forwards, providing for a service in either direction every 2½ min.

That Mr. Chalmers Kearney had made a strong case for his system, particularly in regard to the feasibility of building tube railways in London with shallow instead of deep level stations, and thus eliminating the necessity for lifts and escalators, was generally admitted by the members present.

American Railway Service Under Government Control.

RAILWAYMEN in America have a poor opinion of the future prospects of the railway staff if Government control continues. Witness the following paragraph culled from a Transatlantic periodical, entitled *The Railway Journal*.

In it the Editor remarks:—"In our rounds among railroadmen, particularly with traffic officials, we find quite a number who are contemplating quitting railway service entirely as soon as they can find openings elsewhere. In their conversation they express their belief that there is no longer any future for them in this field of endeavour; that if the Government is to continue to operate the railways, their chances for promotion have gone; that their positions will be looked upon as nothing but routine like the postal clerk, &c. We would say to them that they owe it to their country to remain at their posts till the war is over at least. Their services are needed by the Government, and they should be willing to continue in the railroad service as long as it is at all remunerative. Again, they do not know that Government control will last over 21 months after the close of the war. We can't win the war without railroadmen, that is, experienced men. They are needed at their old-time posts of duty, and we trust they will stick."

Train Heating.

PARTICULARLY opportune at the present time was the recent reading before the Institution of Locomotive Engineers by Mr. J. Carlier of a paper on "The Heating of Trains and the Problem of Coal Saving." The object of the theme was that of commenting upon the advantages of the Bouhon system of feed-water heating, and some interesting technical considerations relative to the subject generally are included in the paper. Mr. Bouhon has been at considerable pains in estimating the consumption of steam in connection with train heating, and the conclusion he has arrived at is that, with trains of medium length, 60 lb. per min., *i.e.*, 3,000 lb. per hour, is reached. For a train running eight hours per day the steam used would be about 28,800 lb., and the coal required to produce that amount of steam would be $\frac{28,800 \text{ lb.}}{8}$ = 3,600 lb. per day. On this basis the amount of coal consumed in the course of six months for heating the train would be 289 tons, but the author admits that in order to provide a sound basis of discussion it would be wise to reduce these figures by 50 per cent. Even then it would seem that a locomotive consumes annually something like 145 tons of coal and even more for the heating of trains. It is contended, therefore, that the heating of trains by means of recuperating the waste products of combustion from the boilers of locomotives represents a very important economy.

A Railway Book of Seventy Years Ago.

MR. BASIL MERCER'S article on "Some Old Railway Books" in the RAILWAY MAGAZINE, October, has reminded Mr. L. B. Hewitt of a quaint old book which he possesses. Unfortunately, the copy is imperfect, but enough remains to prove its great interest. Entitled "The Comic Bradshaw, or Bubbles from the Boiler," it is a small volume of 64 pages, written by Angus B. Reach, and illustrated by H. G. Hine. It was published by D. Bogue at 86, Fleet Street, and the copy is dated 1848. Its price was 6d., and it was described by its author as "a book of Railway Facetiæ." It evidently filled the place of the many chatty periodicals providing information and humour, the growth of which was a feature of the later 19th and early 20th century. All the jokes, articles, or poems had some reference to the conditions of contemporary railway travelling. Many of the illustrations are frankly caricatures, but the little book reveals an intimate knowledge of railway working conditions 70 years ago. A "peep into futurity" results in the publication of a time-table for April 1st, 1948, which shows the existence of an Eastern Counties Line—readers will recollect that the Great Eastern was originally styled the "Eastern Counties." Starting from Shoreditch — now Bishopsgate, and the old terminus—at 6 a.m., Bow was reached half-a-minute later, and Constantinople at 6.45. Successive stations were Aleppo, Jericho, Ispahan, Bagdad (the old jest reads strangely now!), the site of Babylon, Canton, and Pekin. Six hours was given as the inclusive time from London to Pekin! Another forecast of the same date hints at the existence of "hackney flying machines," which may be in general use before 1948!

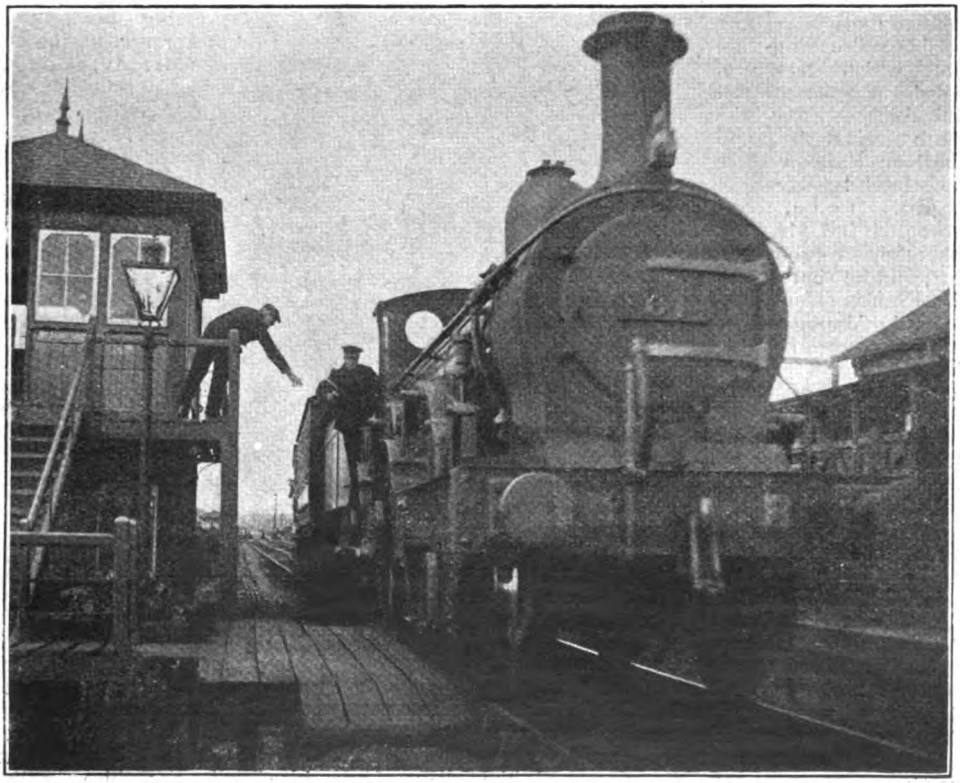
Digitized by Google

Locomotive Engineering Training.

RAILWAY MAGAZINE readers of "the rising generation" who aspire to become locomotive engineers are best advised to enter a locomotive works in preference to serving an apprenticeship or pupilage in "general" shops and then seeking to specialise in locomotive engineering. It is a moot question whether it is better to enter a railway company's works or those of a firm of locomotive builders. On the one hand, the student gets an insight into actual railway, as well as locomotive, practice (if a pupil), but, on the other, in a firm's work, he gets knowledge of locomotive design and construction for different requirements, varying gauges, standards, etc., for railways abroad as well as at home. It is usually considered necessary to complete the apprenticeship at the age of twenty-one, so that anything in the way of a late start affects the time in which one has to learn the business, and the nearer to five years the training goes the better it is for the applicant in after life when seeking a position and setting forth his experience in the past.

It depends upon a parent's or guardian's means as to whether a boy is sent to the works as a pupil or as an apprentice. If the former, a premium will have to be paid, varying from £100 to as much as £300 for a term of years, and no remuneration will be paid to the pupil himself during the term. If an apprentice, either nothing at all or a small fee will be required, and, moreover, the apprentice will receive a weekly "wage"—in these days quite a considerable amount (with bonus) in most shops.

The pupil goes through all departments, including drawing office and locomotive running department. The apprentice, as a rule, has to decide (or have decided for him) whether he will be a "fitter and turner," erecting hand, or what not, and his tuition is confined to those branches mainly. To become a fully-fledged locomotive engineer it is desirable, if possible, to serve a pupilage to a railway company or in a first-class locomotive building works, although, for the matter of that, some of the best of locomotive engineers have had nothing more than an ordinary apprenticeship to rely upon.



Photo] [*F. H. Stingemore.*

"CATCHING THE TABLET."

Photographed just as the engine-driver had caught the tablet on his arm. Midland Railway 2-4-0 (Kirtley) locomotive, No. 61.

Digitized by Google

By the King of the Belgians, Mr. Edwin Charles Cox, C.B.E., Superintendent of the Line, South Eastern and Chatham Railway, has been created a Chevalier of the Order of Leopold. Mr. Cox was appointed to his present position in June, 1911. Since the outbreak of war he has rendered yeoman service in the organisation of the transport of troop trains, Red Cross trains, military stores, guns, &c. He has proved himself a railway officer of the highest capacity. It would be difficult to point to more clever and capable railroading than that which has prevailed—in spite of all difficulties — on the South Eastern and Chatham Railway since the fateful days in August, 1914, and through it all Mr. Cox has taken a prominent part, and he shares with Sir Francis Dent, the General Manager, no small measure of appreciation on the part of those who are capable of correctly judging the war-time working of British railways.

* * *

It is with great regret we record the death on October 7th of Mr. William C. May, Chief Traffic Manager, Great Eastern Railway. He died at his residence at Hadley Wood at the comparatively early age of 49. It was in November, 1914, that Mr. May was appointed Chief Traffic Manager of the Great Eastern Railway, with control of the passenger and goods departments. The deceased officer entered the service of the Great Eastern Railway in the rates office of the Goods Department in January, 1886. He was appointed Mineral Manager in 1903, and Chief Goods Manager in 1910. In connection with reorganisations carried out during 1915, the scope of Mr. May's department was considerably extended, and so that it covered both the goods and passenger sections, including commercial and operating sides. In the absence of Brigadier-General Thornton on war service, Mr. May was appointed Acting General Manager.

THE LATE MR. WILLIAM C. MAY,
Chief Traffic Manager,
Great Eastern Railway.

* * *

H.M. the King sent a telegram to Lord Claud Hamilton, Chairman of the Great Eastern Railway, expressing his sympathy and regret at the death of Mr. W. C. May, Chief Traffic Manager and Acting General Manager, and requesting that it should be communicated to the relatives. The funeral of Mr. May took place at Golders Green Crematorium, in the presence of a very large number of directors and officials of the Great Eastern Railway, relatives, and personal friends, among them being Sir George May (brother), Mr. H. J. Biggs (representing Lord Claud Hamilton, chairman of the Great Eastern Railway), Mr. A. P. Parker (representing the Right Hon. Sir Ailwyn Fellowes, deputy-chairman), Col. W. J. Galloway, Mr. C. Eric Hambro, Brigadier-General H. W. Thornton (General Manager and Engineer-in-Chief of the railway), and Mr. S. A. Parnwell (Secretary). Mr. C. E. Stott (London Superintendent, Lancashire and Yorkshire Railway) represented Mr. H. Marriott (Chief Goods Manager of that Company). Mr. I. T. Williams represented the L. & N.W. Railway, and Major G. S. Szlumper was present on behalf of the Railway Executive Committee.

Digitized by Google

HEARTY congratulations are accorded by the RAILWAY MAGAZINE to Mr. Charles L. Conacher, O.B.E. (formerly Traffic Manager, Cambrian Railways), on his promotion from the rank of Staff-Captain to that of Major for special services in the Ministry of Munitions since its formation in May, 1915, on the personal recommendation of the Deputy Minister, General Seely. Major Conacher's first introduction to railway work was in the service of the Cambrian Railways in the 'eighties, during the time of his father's management of that system. While there he passed through every department at headquarters, and in 1891 had qualified to take a position on the staff of the Superintendent of the Great Northern Railway at King's Cross. In 1896 he was appointed Manager of the Isle of Wight Central Railway, and while in that position, in addition to acquiring a vast amount of detail knowledge of railway working, he did much to make known far and wide the attraction of the "Garden Isle" as a holiday and health resort. In 1910 he became Traffic Manager of the Cambrian Railways, resigning that appointment in 1914 upon a reorganisation of the executive staff. After a tour through Canada for health reasons, Major Conacher, at the outbreak of war, offered his services to the War Office, and was appointed Railway Transport Officer at King's Cross and St. Pancras Stations in October, 1914, and afterwards transferred to the staff of the Deputy-Director of Railway Transport, War Office, where he remained until May, 1915, when his services were applied for by Sir Percy Girouard, who was then forming the staff of the Ministry of Munitions for Mr. Lloyd George. The war has interrupted, but not severed, Major Conacher's railway connection, and at the conclusion of hostilities RAILWAY MAGAZINE readers may expect to see him once more holding a leading place in the railway world.

MAJOR CHARLES L. CONACHER, O.B.E.

* * *

THE Road Transport Board of H.M. Board of Trade has appointed Mr. H. J. Jewell (Great Northern Railway), Chairman of the Divisional Board and Divisional Road

Digitized by Google

Transport Officer for London and the Home Counties. While Mr. Jewell is a loss to the railway service, he is a distinct gain to the State, for he has in the past proved himself an exceedingly capable official. While in charge of the Advertising Department of the Great Northern Railway one of Mr. Jewell's pre-war activities was the booming of Skegness, and right well he did it. There are few RAILWAY MAGAZINE readers who do not remember the famous poster, "It is so Bracing."

* * *

AT Sanderstead, on Wednesday, October 9th, there was an influential gathering of subscribers to witness the presentation of an illuminated address and a substantial gift to Mr. A. Taylor, the Stationmaster, who has now been promoted to a similar position at South Croydon. Mr. S. Bowman presided, and said he knew he voiced the feeling of all when he said what pleasure it gave them to make this present. Although they were sorry Mr. Taylor was leaving, they felt they would like to give some expression to the appreciation of his conduct while with them. After a few further remarks, he asked Mr. Taylor to accept on the behalf of the subscribers a testimonial, accompanied by War Savings Certificates of £100, and a cheque for the balance, £31 12s. 9d., with all good wishes for success in his new post. Mr. Taylor, in responding, said how gratified he was with the mark of their appreciation, and thanked all the subscribers from the bottom of his heart. The testimonial, signed by the committee on behalf of themselves and 318 residents, testified to their appreciation of the courteous and able manner in which Mr. Taylor had fulfilled his duties during the seven years of his appointment, and also as a token of their esteem and good wishes for his welfare and success in his new sphere of action.

* * *

SIR ERIC GEDDES, First Lord of the Admiralty (Deputy General Manager, North Eastern Railway), arrived on October 8th with the Naval Mission from Great Britain to the United States at Washington, where the Mission was received by the Secretary of the Navy, Mr. Daniels, and the naval officials. Sir Eric called at the State Department, where he was received by Mr. Lansing. President Wilson gave a luncheon at the White House in honour of Sir Eric and the members of the Mission. Recalling his former residence in America, where he began his railway career, Sir Eric, in a statement to the Press, said: "I am delighted to be in America again. It feels like getting back home."

* * *

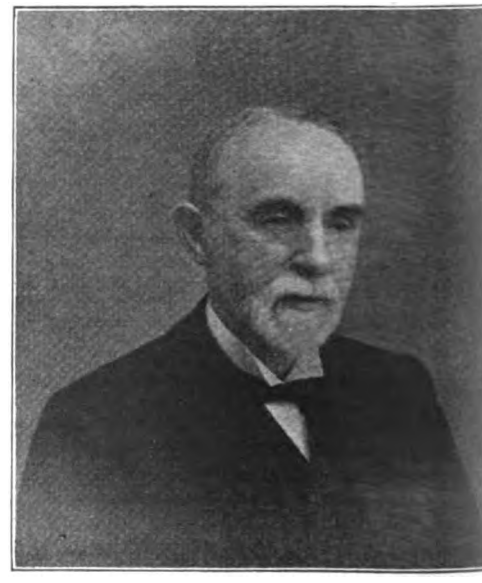
MR. LOFTHOUSE SMITH, who recently retired from the outdoor staff of the Great Northern Railway, has been the recipient of a gold watch subscribed for by the traders in St. James's Market, Bradford, as a token of their esteem. Mr. Smith has completed exactly 50 years' service with the company, and for some 14 years has represented it in the market. Mr. John Scott made the presentation on behalf of the traders, and Mr. Smith, in replying, said he should value the inscription on the watch as much as the article itself. His colleagues and a few outside friends presented Mr. Smith a few weeks ago with a timepiece and ornaments.

* * *

RECENT railway obituary includes the death of Mr. Daniel Pendleton, the American Passenger Agent of the London and North Western Railway, at Riverside Station, Liverpool.

* * *

MR. ROBERT WILD, one of the victims in the recent Irish mail boat outrage, belonged to a North of England family. He served his engineering apprenticeship in Cowan Sheldon's Engineering Works, Carlisle, and after getting further experience in various engineering shops in the North of England, he joined, in 1876, the old Dublin and Drogheda Railway in Dublin, under the late



THE LATE MR. ROBERT WILD,
Works Manager,
Great Northern Railway (Ireland) Works,
Dundalk.

Mr. William Curry, then Locomotive Superintendent. Mr. Wild continued in the service of the G.N. Railway (Ireland) after the amalgamation, and was appointed Chief Draughtsman at Dundalk Railway Works in 1881. He was appointed Works Manager in 1892, and has been associated with the Dundalk Railway Works since its

Digitized by Google

formation, and has co-operated with successive Locomotive Superintendents in planning and carrying out the various extensions and improvements which have brought the works to its present state of efficiency. Mr. George H. Wild, Locomotive Engineer, Dublin and South Eastern Railway, is a son of the late Mr. Robert Wild, and RAILWAY MAGAZINE readers will sympathise with him in his tragic loss.

* * *

SECOND-LIEUT. ALFRED HARRY THOMAS GENT, Sherwood Foresters, has been killed in action on the Western Front. He was 28 years of age, and joined the Seaforth Highlanders November 1st, 1915. On being granted a commission on August 1st, 1917, he was transferred to the Sherwoods. He was recently recommended for the Military Cross. Previously he was on the clerical staff of the Chief Goods Manager of the Midland Railway at Derby. He entered the service as a junior clerk at Belper in July, 1904, was removed to Oldham in 1906, to Liverpool (Sandon Dock) in 1911, and went to Derby in December, 1913. A few months ago this gallant young soldier was gassed, and was under treatment in hospital when the building was bombed by enemy aircraft.

* * *

THE London, Brighton and South Coast Railway have just issued the third list of honours and decorations awarded to their staff on active service. The total number of recipients is 53, and the decorations include 34 Military Medals and one bar thereto, 8 Distinguished Conduct Medals, 5 Military Crosses and one bar thereto, 4 Meritorious Service Medals, 1 Distinguished Service Medal, 1 Belgian Croix de Guerre, 1 French Croix de Guerre.

* * *

WE regret to record the death of Mr. John J. Petrie, Traffic Manager, Midland and Great Northern Railway. Born at Newcastle-on-Tyne in 1856, Mr. Petrie commenced work in the Secretary and General Manager's office of the Swansea Vale Railway, July, 1871, and on the amalgamation of that line with the Midland Railway in July, 1874, was transferred to headquarters at Derby. On July 1st, 1895, he was appointed Traffic Manager of the Severn and Wye and Severn Bridge Joint Railway (G.W. and Midland), and on July 1st, 1898, to the position he held until his decease. Mr. Petrie was Chairman of the Railway Claims Arbitration Committee (Goods Managers' Conference), 1909.

* * *

MR. A. H. POTT, M.Inst.C.E., M.I.E.E., has resigned the managership of the Metropolitan Electric and London United Tramways, Ltd., in order to take up a position under the Tramways (Board of Trade) Committee. The two tramway companies have, however, been able to retain Mr. Pott's services in a consultative capacity. Mr. C. J. Spencer, Manager of the Bradford Corporation Tramways, has been appointed to fill the vacancy created by Mr. Pott's resignation.

* * *

FROM Montreal it is announced that Lord Shaughnessy has resigned the Presidency of the Canadian Pacific Railway. He was born in 1853 at Milwaukee, where he received his education at the common schools. He began his railway career at the age of 16, when he entered the service of the Chicago, Milwaukee, and St. Paul line, and, rising step by step, became Assistant General Manager, and then Vice-President and Director of that Company. It was in 1891 that he entered the service of the Canadian Pacific Railway, and eight years later became President (or, as we should say, Chairman) of that great system. He is also President or Director of a number of other railways, all of which are directly or indirectly connected with the Canadian Pacific Railway. In 1901 he received the honour of knighthood from Queen Victoria, and in January, 1916, was created a peer. Lord Shaughnessy, who retains the Chairmanship of the Board, will be succeeded by Mr. E. W. Beatty, the present Vice-President. Sir George Bury is retiring from the Vice-Presidency on account of ill-health. He will be succeeded by Mr. Grant Hall.

LORD SHAUGHNESSY.

* * *

SIR GEORGE BURY, Vice-President of the Canadian Pacific Railway, is a Montrealer by birth, and has been connected with the Cana-

Digitized by Google

dian Pacific Railway since 1883, when he entered the employ of the Company as a junior under Lord Shaughnessy. His abilities as a railwayman quickly became apparent, and he rose step by step through the

SIR GEORGE BURY

offices of Divisional Superintendent, General Superintendent, General Manager of the Western lines, and Western Vice-President, to his present position.

* * *

At a meeting of the Irish Railway Managers' Conference held at the Railway Clearing House, Dublin, on October 17th, Mr. James Cowie, Midland Railway (Northern Counties Committee), was unanimously elected Chairman of the Conference for the ensuing year. Mr. Cowie occupied a similar position in 1912. Born in Belfast in 1855, he entered the service of the Belfast and Northern Counties Railway in the General Manager's office. He became Chief Clerk successively in various departments, and in 1885 was appointed principal assistant to the Manager. On the decease of Mr. Cotton in 1899, he succeeded as Manager. The Belfast and Northern Counties Railway was acquired by the Midland Railway of England in 1903, the administration being entrusted to a Committee of Directors known as the "Northern Counties Committee." Since 1905 Mr. Cowie has acted as Secretary and Manager.

* * *

MR. G. PRITCHARD sends some interesting train working notes from Chester. The G.W.R. 4-6-0 engines, he says, have not yet as a general rule penetrated beyond Shrewsbury, but in July the 4-cylinder 4-6-0, No. 4042, *Prince Albert*, was working the 9.40 a.m. ex Chester North to West express for a week only. This week also a 2-cylinder 4-6-0, *Croome Court*, is working the same train. This train is always quite heavily loaded, usually to about 12 bogies, mostly 70 ft. corridor stock. On the L.N.W.R. North Wales route, too, a great variety of locomotives is to be seen on most of the leading expresses; the "George the Fifths" and superheated "Precursors" reign supreme. However, the 4-cylinder rebuild *Prospero* is sometimes to be seen. Last time he saw it, it was working the 8.10 a.m. ex Euston day Irish mail, which leaves Chester at 12.18 p.m. (5 min. more being now allowed to Holyhead). Immediately afterwards the 12.30 ex Chester North Wales "semi-fast" drew out, an "Experiment," *Leicestershire*, and a "Precursor," *Pacific*, hauling a 12-coach train of small bogies and six-wheelers, whereas *Prospero* had 15 large bogie coaches, including Post Office mail van, totalling about 450 tons, as the train was packed. A "George the Fifth" usually works the Irish mail. The "Claughtons" have not yet appeared on the North Wales section, the only exception he has seen being No. 2204, *Sir Herbert Walker, K.C.B.*, on a train of "foreign" cattle trucks. The hero of the 1895 race to the North—the 2-4-0 engine *Hardwicke*—was to be seen ingloriously engaged in shunting at Saltney Ferry (Mold Junction) a few days ago. *Sic transit gloria mundi!*

* * *

THE vegetable and flower show held by the Underground Railway Horticultural Society in September was a marked success, there being 404 exhibits this year, as against 227 in 1917. The prizes were distributed at a special smoking concert held at the Albert Stanley Institute on the evening of October 8th. Hearty congratulations were accorded Mr. G. Jenner, who secured the Royal Horticultural Society's "Banksian" medal for winning the largest number of prizes in the show, viz., 28; and special mention was made of the excellent exhibits of Messrs. F. W. Howlett, W. Collis, E. Fairchild, S. Ealey, A. Jacobs, G. Revere, T. Watson, and F. Cook.

* * *

FROM Tuesday, October 15th, the London, Brighton and South Coast Railway has discontinued the 8.12 a.m. train from Victoria to Brighton, the 5.35 p.m. train from Victoria to Brighton and Worthing, and the train which leaves Worthing at 2 p.m. and Brighton at 2.50 p.m. for Victoria.

* * *

A SUCCESSFUL test of telephone communication between a train despatcher's office and a moving train has been made by the

Digitized by Google

Canadian Government. The device embodies features that are said to make it usable in a practical way. The track is used as the conductor, and the electrical current reaches the moving train through its wheels. The test was made between Moncton and Humphrey's Station, New Brunswick, on the Canadian Government Railway.

* * *

WRITING from a Kentish village near Canterbury, Mr. C. Huddlestone remarks:—Other readers of the RAILWAY MAGAZINE may be interested to know that the following Stirling 4-4-0 engines of the South Eastern and Chatham Railway are now rebuilt with extended smokeboxes:—240 class: Nos. 140, 156, 226, 246, 249; 440 class: Nos. 13 and 449. These engines all have domed boilers, with the exception of No. 13. This engine retains the Ramsbottom safety valves in the centre of the boiler barrel. No. 13 is rebuilt for the first time, but all the rest had been previously rebuilt with standard boilers and short smokeboxes. As rebuilt their appearance is greatly improved, and No. 13 has been supplied with a new pattern chimney, as fitted to a number of engines of all classes, both 4-4-0 and 0-6-0. Several engines are also being supplied with new high-sided tenders.

* * *

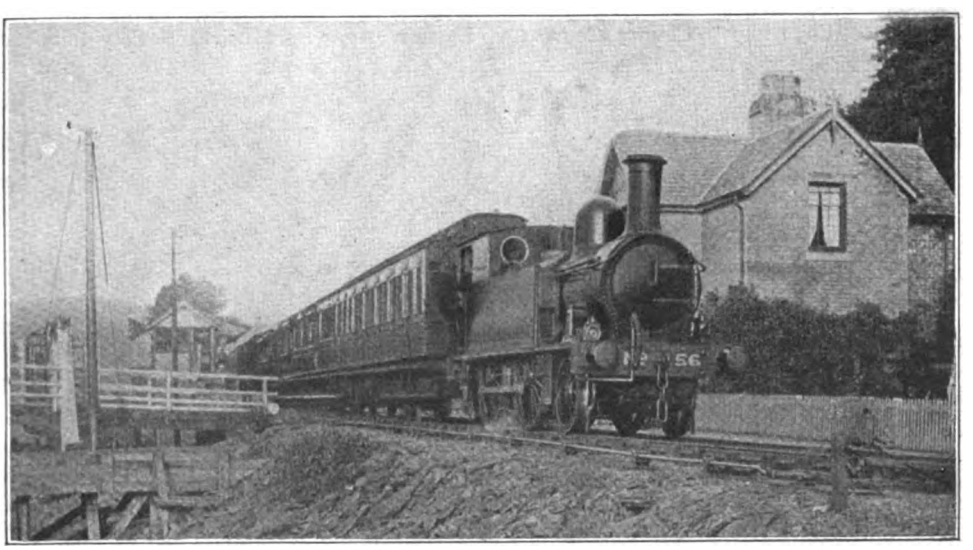
AMONG the latest activities of the London "Safety First" Council is the issue of a Meritorious Service Award, the object of which is to recognise the conspicuous acts of merit performed by any persons in connection with the prevention of accidents. So far as railway employees are concerned, they are eligible for recognition whilst engaged in the performance of their duties within a radius of 20 miles of Charing Cross.

* * *

AN Army Council instruction calls attention to the large number of packages of military stores which continue to be conveyed by passenger train, and to the serious difficulty in handling the traffic with the depleted staff and female porters. It is pointed out that the Railway Executive Committee considers that greater use should be made of the goods train services generally than at present prevails, and that passenger train services should not be utilised unless the traffic is of an urgent character.

* * *

AT the instance of the London, Brighton and South Coast Railway ten summonses were recently heard before Mr. Mead at the Tower Bridge Police Court for the improper use of privilege tickets granted to their servants. There were three distinct cases in which railway servants obtained privilege tickets at quarter rates and sold them to persons not entitled to use them. Mr. Mead said that there was an outcry against railway travelling, fares were increased 50 per cent., trains were so crowded that season ticket holders had to stand in luggage vans for nearly 50 miles, and yet railways put out the temptation of privilege tickets at quarter



Photo] [*H. C. Doyne.*

CAMBRIAN RAILWAYS.

Through G.W.R. train, Paddington to Barmouth.
Cambrian 2-4-0 tank locomotive, No. 56.

Digitized by Google

fares to all their servants. It was certainly not fair to the public. Mr. Rutherford, for the railway, said that the issuing of privilege tickets to railway servants would not lead to the overcrowding of trains. It would be very difficult to withdraw the privilege. Mr. Mead said that the issuing of such tickets must affect the accommodation. The point was that, while railways discouraged the public to travel, they offered facilities to all their employees to travel at quarter rates. The privilege was not even limited to old servants. The defendants were fined various amounts from 40s. to 15s. and ordered to pay costs.

* * *

THE Rev. Carew St. John Mildmay, who stated he was Chairman of the "Exercising Rights League," sued the Metropolitan Railway at Whitechapel County Court to recover money due on a season ticket which had been confiscated by the railway company. He was said to have continuously refused to show his ticket at the barrier as a way of asserting his rights, but to have complained once to a collector at Wapping that it was defaced and then to have sent it on to the company. Judge Cluer held that the railway had a right to confiscate.

* * *

A USEFUL experiment in connection with the saving of fuel is now being made on the Great Northern Railway. On the railway's premises and carriages use is now being made of a mixture one-half coal gas and one-half oil gas, and very satisfactory results have been obtained.

THE decision of the Light Railway Commissioners in respect of the application for an Order to construct a light railway, 23 miles in length, between Longridge and Hellifield, is announced. Subject to certain reservations regarding economic fluctuations, and to promoters modifying the scheme so as to reduce the capital cost to about £6,000 a mile (the estimated cost was about £10,000 a mile), or if in the alternative they can obtain the promise of a subsidy from the public sources to cover the additional cost beyond £6,000 a mile, the Commissioners would be prepared to submit the Order to the Board of Trade for confirmation; otherwise, the prospects of the scheme would hardly justify them in granting the application.

* * *

AMONG the recent activities of the Great Eastern Railway Musical Society has been a concert for Australian soldiers at the Aldwych Theatre, now taken over by the Y.M.C.A. At the conclusion hearty cheers were given to the Society, and Col. William Johnson Galloway, of the Great Eastern Railway Directorate, in responding, said they would be delighted to repeat their visits. The Musical Society on Oct. 9th paid its third visit to the Prince of Wales Hospital, Marylebone.

* * *

STOCKHOLM advices recently reported a terrible train disaster at Malmoe, when the Stockholm main line train, with eight coaches, ran down a very high railway embankment which had been undermined by several weeks' rain and had caved in. The escaping gas set on fire the entire train,

Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Up coal train, Toton to London, approaching Bedford.
Two 4-4-0 type passenger engines.

Digitized by Google

which is still burning. The number of victims were stated to be between 100 and 200 dead and about 60 injured. Many people were burnt to death. Among the dead are about 50 children who were on their way to their homes in Stockholm after a stay in the country.

* * *

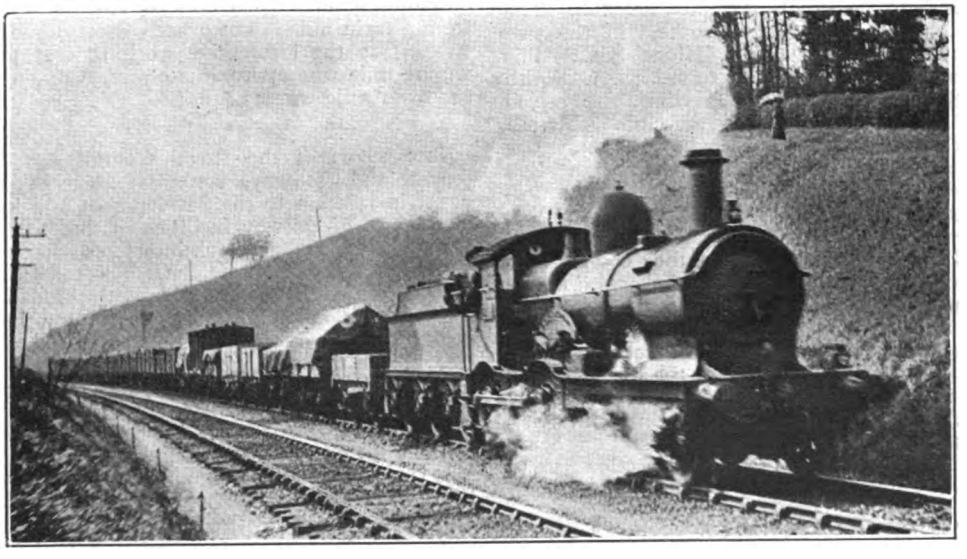
ALL firms who desire to know what their rivals are doing and planning—notably those in enemy States—and what are the economic conditions and trading prospects in foreign countries can now obtain two valuable War Office publications issued fortnightly, the Economic and the Reconstruction Supplements to the *Daily Review of the Foreign Press*. The price of these supplements will be 6d. The Economic Supplement deals with trade and commerce, railways and shipping, banking and finance, labour conditions, social and economic policy and legislation, &c. The Reconstruction Supplement describes the measures being taken or suggested in Germany and elsewhere in connection with the return to peace conditions. Half-yearly indexes to the above, price 6d., can also be obtained. These publications will be issued by His Majesty's Stationery Office, and can be purchased through any bookseller.

* * *

BISHOP MACINNES, who recently returned from the East, writes:—"When I was in Alexandria I saw railway trucks labelled 'To Jerusalem,' which would go straight through on a broad-gauge track, over the Suez Canal by the swing bridge, then across the desert, and thence up the hills into Jerusalem. It was curious to see in the Jerusalem railway station engines marked L.S.W.R."

* * *

IN March, 1917, on completion of the military extension line from Bisley to Deepcut, the War Department undertook the working of the new line and also of the London and South Western Railway branch line, Brookwood to Bisley. It has recently been arranged for both sections to be worked by the London and South Western Railway. Mr. Richards, Stationmaster Brookwood, has the supervision of the lines and of the four stations served, Bisley, Blackdown, Deepcut, and Pirbright.



Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Great Western Railway "Duke" class, 4-4-0 locomotive, No. 3281, *Cotswold*, hauling a goods train from Reading, near Betchworth.

PEDESTRIANS and vehicular pasengers crossing London Bridge during the recent War Loan campaign could not help noticing the gigantic admonition posted right across the centre of the neighbouring Cannon Street railway bridge of the South Eastern and Chatham Railway, viz.: FEED THE GUNS WITH WAR BONDS and HELP TO WIN THE WAR.

* * *

As will be seen by advertisements in this issue of the RAILWAY MAGAZINE, there are a number of staff vacancies on the West African Government Railways. The grades concerned include traffic inspectors, fitters, boilermakers, engine-drivers, guards, and platelayers. Salaries range from £200 per annum

Digitized by Google

upwards, with war bonus for men with dependents. Free quarters, free passage, and liberal leave are offered. There is likewise a vacancy for a deputy stores superintendent on the Federated Malay States Railway. Intending applicants should carefuly read the advertisements, and in writing the Crown Agents for the Colonies, 4, Millbank, S.W.1, should mention the RAILWAY MAGAZINE.

* * *

MEMBERS of the Cambridge Railways Miniature Rifle Club enjoy the hearty support of Mr. E. Robinson, the Great Eastern Railway's popular District Commercial Superintendent, and his public-spirited predecessor, Mr. A. C. Hutcherson. At the recent distribution of prizes and certificates by Mr. Robinson, to Mr. Hutcherson was given the pleasant task of presenting the cup which, when he was its President, he kindly gave to the club. The Hutcherson Cup had been held in the two previous years by Mr. S. Hiner, but on this occasion the top-scorer was Mr. A. Smith (298 out of a possible 360), who also received the smaller cup given by the club. Mr. L. Lucock, the runner-up, who was only one point behind Mr. Smith, received a Bell Medal. Mr. Hutcherson cordially congratulated Mr. Smith and Mr. Lucock, and requested that the challenge cup should be filled and passed round among the company in order that they might drink the health of the winner. Preceding the before-mentioned function there was a shooting match at the rifle range between teams representing Liverpool Street and Cambridge, the former being captained by Capt. Mills and the latter by Mr. Buck. The result was a win for the visitors, the scores in the men's section being 722 to 640, and in the ladies' section 346 to 303.

* * *

THE General Electric Co., Ltd., desire to announce that they have completed the purchase of the Erith Works, and of the goodwill of the manufacturing business hitherto carried on by Messrs. Fraser and Chalmers, Ltd. Practically the whole of the personnel have transferred their services to the G.E.C., who will carry on the business as a going concern and under the title of Fraser and Chalmers Engineering Works.

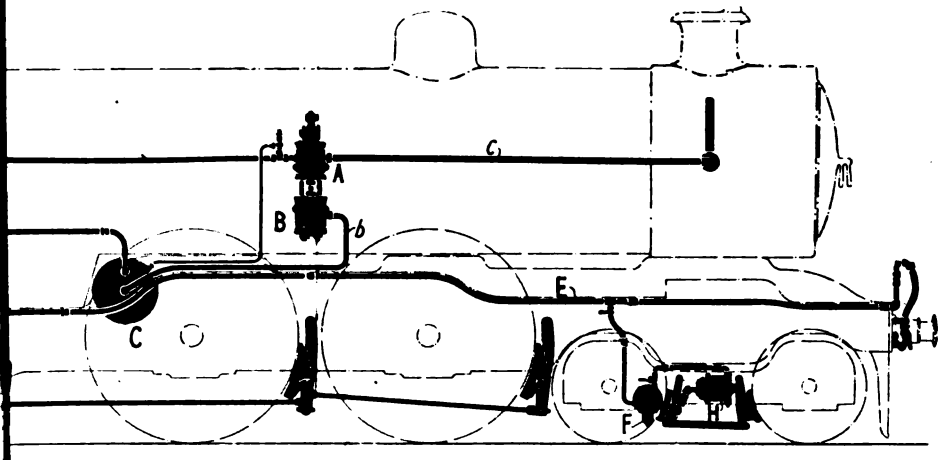
* * *

THE Royal Commission appointed to inquire into the working of the Queensland Railways in one part of its lengthy report makes the following remarks on efficiency: "One other test of efficiency we have applied—that is, the number of engine miles run per 100 train miles. From the year 1900-01 to the year 1909-10 from 115 to 118 engine miles were run per 100 train miles. From the year 1903 to 1910 it varied only from 117 to 118. That seems to have been a fairly constant factor, but for the years 1910-11 to 1916-17 there has been almost a constant increase, until in the last year under review 128 engine miles were run for every 100 train miles. It is difficult to say in any given case that the reason in that particular instance for running a light engine or other unproductive mileage is unsound, but it seems to us this is rather a serious matter, viewed as a whole. There were 10,738,253 train miles run in 1916-17. Had that traffic been run with only eighteen additional miles of engine miles per 100 train miles, as it was in the ten years preceding 1910, then the engine mileage would have been 1,141,115 miles less. The cost per mile of running an engine mile as distinguished from a train mile is not exactly ascertainable. In 1916-17 the locomotive working cost per engine mile was approximately 1s. 6.4d., and per train mile was 23.44d."

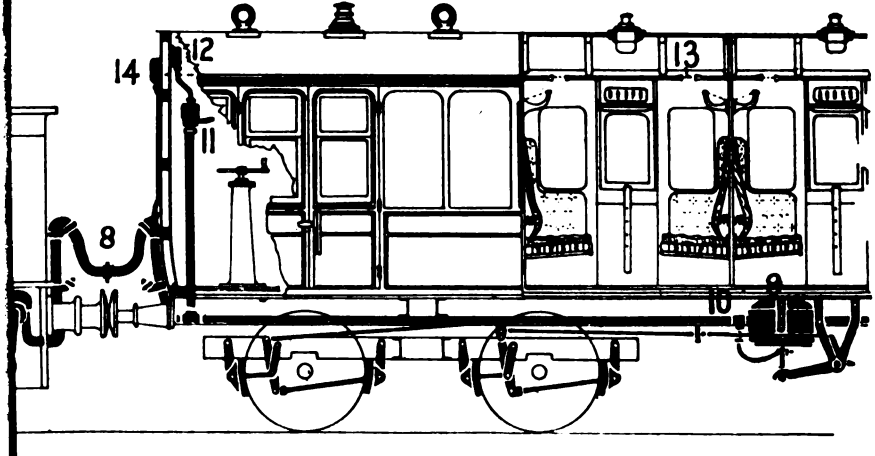
* * *

THE report of the Royal Commission on Queensland Railways contains much of interest in relation to the development and improvement of railway facilities in that State. It says: One factor which interferes with the economy of the construction of new railways, and of new work in connection with the existing railways, is having under way at one time construction at more points than the exigencies of the treasury will allow to be carried on in full swing. Our attention has been called in a number of instances to the work, some of very considerable importance, which on completion had been found to be unsuitable, in location or design. There seems to have been occasions when even the merest type of workman on the job was able to perceive unsuitability, and notwithstanding the plans are carried out because they are plans. Placing the responsibility on every employee in charge of the job would, we think, have a salutary effect. Regarding the Ipswich workshops, the report states that, generally speaking, the system of management, control and working of the workshops appeared to be well devised for efficient working and management. Respecting the construction of rolling stock, the Commission recommended that on lines of economical working, when any particular work had been commenced, it should be completed without interruption, as all concerns worked with better result when allowed to proceed at full swing than when diverted from one half-finished job to another.

Digitized by Google



—Triple Valve. G—Auxiliary Reservoirs.
team Piping.

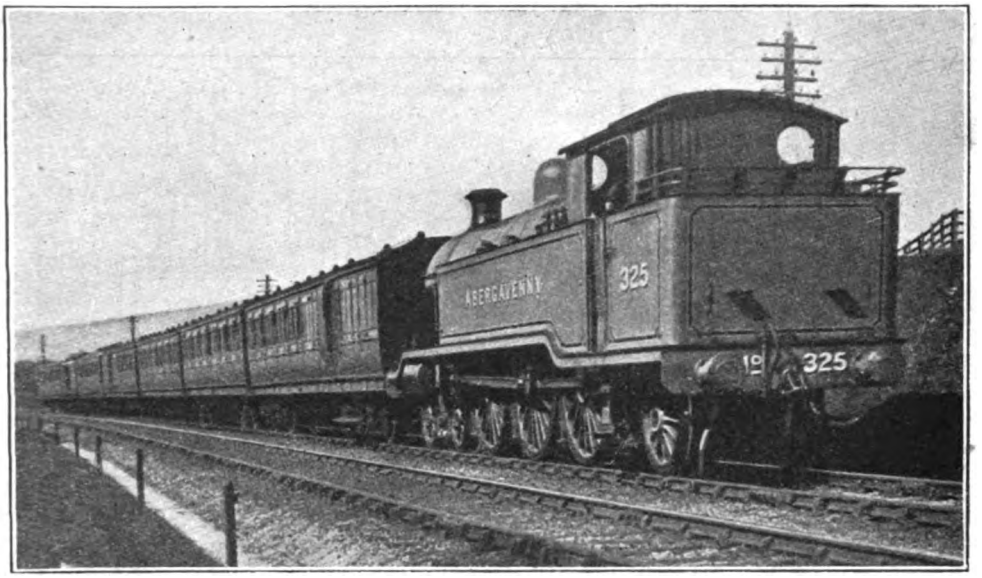


rap and Valve. 8—End Pipes and Couplings.
14—Air Valve.

CHART

Digitized by Google

Digitized by Google



Photo] [*R. W. T. Collins.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Down train hauled by 4-6-2 tank engine, No. 325, *Abergavenny*.
Fitted with Westinghouse Brake.

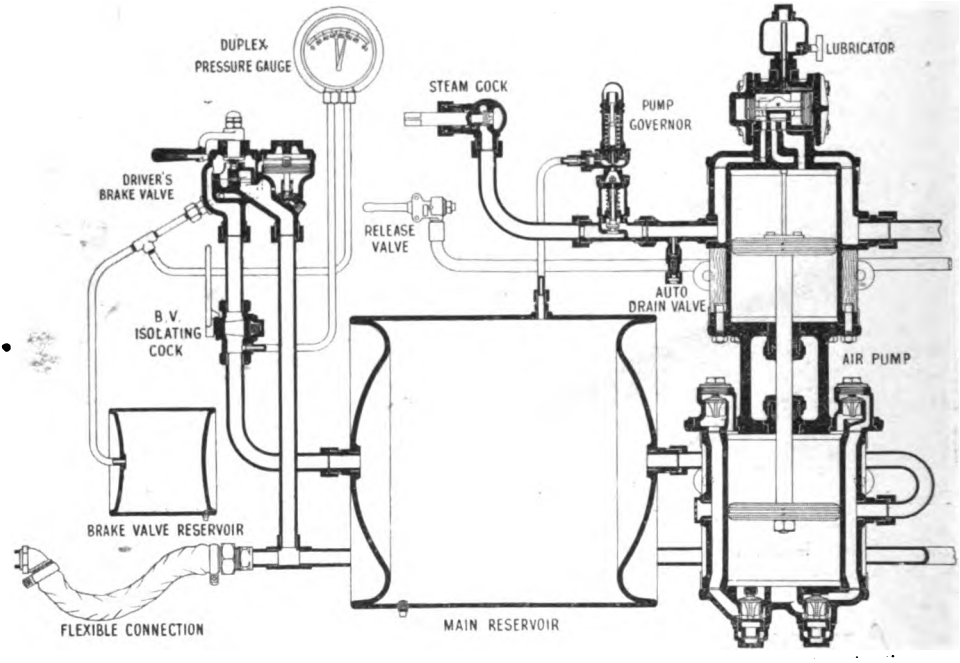
Automatic Continuous Brakes on Railways.

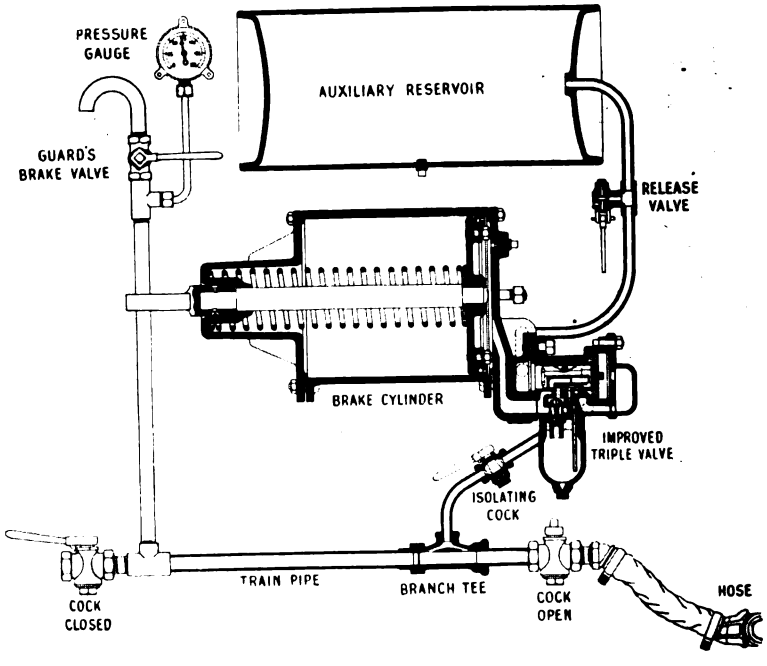
WHEN we think of speed on railways we concern ourselves mostly with the ability of the locomotive to overcome the obstacles in its path in the way of train resistance and the gradients encountered in the course of a run. The locomotive is undoubtedly the factor which counts in the building up and maintenance of speed, but a moment's reflection will suffice to remind us that without an adequate braking system speed would be impossible with safety; therefore, one of the first considerations in planning locomotives and rolling stock must be that of the ability to *stop* the trains as well as to accelerate them to the required speeds from a state of rest.

The evolution of brake apparatus on railways has passed through many phases. The earliest and crudest forms of hand-brakes long since gave way to improved mechanism of various kinds, some still operated by hand, others by steam, and others, again, by the use of compressed air, etc. The manipulation of a small handle in the driver's cab is sufficient to rapidly apply the brakes to all the vehicles throughout the train simultaneously and bring them to a state of rest in a very short space of time and distance even when running at the highest speeds, and to do this with certainty when called upon in an emergency to reduce or altogether stop the rate of progress of the train.

Every reader of the RAILWAY MAGAZINE will be familiar with the names, if not also with some of the details, of the two leading forms of brake mechanism employed in this and other countries. It will, however, no doubt, serve a useful purpose if we briefly enumerate the main features of each system and the principle upon which they operate in each case. The brakes referred to are the Westinghouse and the Vacuum. In the first case, with the Westinghouse the principle involved is that of charging the whole system with air compressed to any desired pressure, which air the triple valves automatically admit from the reservoirs to one side of the pistons in the brake cylin-

Digitized by Google





DETAILS OF THE WESTINGHOUSE BRAKE.

Digitized by Google

ders, when the pressure in the brake pipe is reduced, thereby moving these pistons within the brake cylinders. These pistons have attached to them lever-mechanism which conveys the pressure on the pistons to the brake blocks. The brakes are released by restoring the pressure in the brake pipe, thus automatically moving the triple valves to release to the atmosphere the pressure which they had previously admitted to the brake cylinders.

In the case of the Vacuum brake, the principle involved is that of the creation of a vacuum throughout the whole system, which vacuum is automatically retained in the brake cylinders on one side of the pistons by means of a valve when atmospheric pressure is admitted to the brake pipe and below the pistons, thereby actuating the pistons within the cylinders to apply the brakes, whilst for releasing them the vacuum is restored in the brake pipe and below the piston by removing the atmospheric pressure.

In either case, the manipulation of the "driver's valve" in the cab suffices to automatically apply or release the brakes from one end of the train to the other, whilst an additional means of application is provided in the guard's van or vans, no matter how the train may be made up.

The Westinghouse Brake.

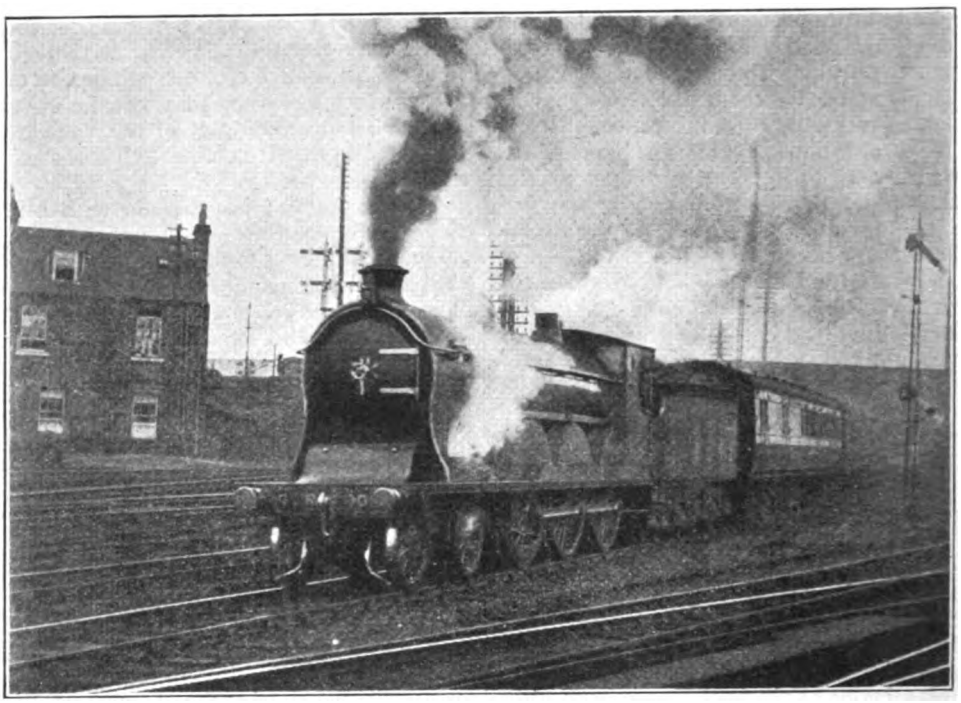
The Westinghouse brake is applied to locomotives and trains in two separate forms, namely, the "ordinary" automatic and the "quick-acting" brake apparatus. The accompanying diagram shows the general application of the mechanism to a locomotive and one coach. The essential parts of the apparatus are a brake cylinder (H), containing a piston with rod, attached to the brake gear in such a manner that the brakes are applied when the piston is forced out by air pressure; an auxiliary reservoir (G), in which air, supplied from the main reservoir through the main pipe, is stored, for applying the brake on its own vehicle; a triple valve (F), which automatically admits compressed air from the auxiliary reservoir (G) to the brake cylinder (H) whenever the air pressure in the main pipe is reduced, and discharges the pressure from the brake cylinder into the atmosphere when the original air pressure in the main pipe is restored.

A release valve (J) serves the purpose of releasing the brake by hand, if necessary. On locomotives and tenders these valves are fixed in the cab within easy reach of the driver; on carriages they are so arranged that they can be readily opened from either side of the vehicle by pulling a light wire connected to the valve handle.

The locomotive is provided with a vertical double-acting air-pump, having a steam cylinder (A) and an air cylinder (B), with the usual valves and pistons. The pump is driven by steam, which is drawn from the locomotive boiler, and, after having done its work, it is exhausted through the pipe (E) into the smoke-box, or disposed of in some other way. To regulate the flow of steam to the pump, and, consequently, to govern the work of the latter at the will of the driver, a steam cock (P) is so arranged that it can be closed or opened from the driver's cab. When the steam cock (P) is open the pump will work and force air through the delivery pipe into the main reservoir (C), usually fixed beneath the footplate. A separate pipe leads from the top part of the main reservoir (C) to the driver's brake valve (D), placed in the cab of the engine, within easy reach of the driver. This valve is also connected to the main brake pipe (E), which extends the whole length of the train, communicating with the brake apparatus on each vehicle through a branch pipe. Air-tight connections of the main pipe (E) between the vehicles of the train are formed by flexible rubber hose fitted with iron coupling heads (K), so designed that they may readily be coupled or uncoupled. Stop cocks (N) are placed in the main pipe at either end of each vehicle, in order to close the pipe at the ends of the trains, and to prevent the action of the brake when vehicles are detached.

The air pump (A B), driven by steam from the boiler of the locomotive, compresses air into a main reservoir (C) to a pressure of about 80 to 85 lb. per square inch, or in the case of the quick-acting apparatus, 90 to 95 lb. When the engine is coupled to the train, the compressed air in the main reservoir is turned into the main pipe (E), from which it also passes through the branch pipes, and fills on each vehicle an auxiliary reservoir (G). Thus the main pipe (E), the triple valves (F), and auxiliary reservoirs (G) are all charged with an equal pressure of about 70 lb., but there is no compressed air in

Digitized by Google



Photo] *[R. A. Chrystal.*

CALEDONIAN RAILWAY.
North express leaving Stirling.
4-6-0 locomotive, No. 906.
Fitted with Westinghouse Brake.

the brake cylinders (H) so long as the brake is not in operation.

The brakes are applied to all the vehicles in the train by a reduction of pressure, purposely or accidentally produced in the main pipe (E). In ordinary working this is effected by allowing air to escape by the driver's brake valve (D), but the same result follows on a train breaking in two, or on a rupture of an essential part of the apparatus on any vehicle.

If the air is allowed to exhaust slowly from the main pipe, as in an ordinary application of the brake, the Westinghouse quick-acting brake works in exactly the same manner as the Westinghouse ordinary brake. Each triple valve (F) then permits a portion of the compressed air stored in the auxiliary reservoir (G) to flow into the corresponding brake cylinder (H) and force its piston forward, pressing the brake blocks against the wheels by means of the gear connected to the piston rod. The brake force thus produced corresponds to the reduction of pressure in the main pipe (E); consequently the driver can graduate the action of the brake at will by regulating with the brake valve (D) the discharge of air from the pipe.

If, however, the air is rapidly discharged from the main pipe (E), as in an emergency application of the brake, this will cause a sudden reduction of the main-pipe pressure, and thereby instantly produce the rapid action of the brake. The triple valves (F) then not only allow compressed air from the auxiliary reservoirs to enter their brake cylinders (H), but, in addition, open on every vehicle a large communication, through which compressed air is also admitted from the main pipe (E) into the brake cylinders (H). It will easily be understood that a double advantage is hereby gained, first, in utilising a considerable portion of the air in the main pipe to increase the available brake force in cases of emergency, and, secondly, in producing a rapid reduction of pressure in the whole length of the main pipe, which accelerates the action of

Digitized by Google

the brake with extraordinary rapidity, and ensures practically simultaneous action throughout trains of almost any length.

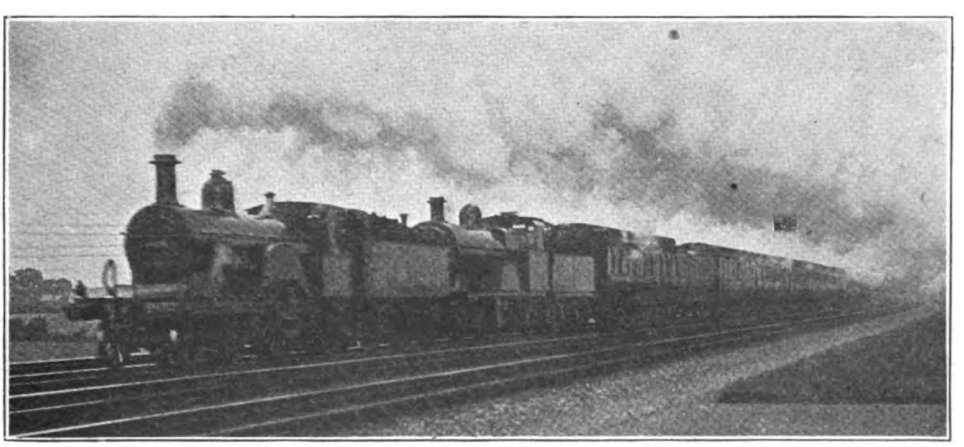
The brakes are released by an increase of pressure in the main pipe, produced by admitting air from the main reservoir (C) through the driver's brake valve (D) into the main pipe (E). This restores the pressure in the main pipe, and causes the triple valves (F) to discharge the air from the brake cylinders (H) into the atmosphere, thus relieving the brake blocks from pressure. At the same time the auxiliary reservoirs (G) are re-charged.

The design of the triple valve has been much improved in its latest form, the principal improvement relating to the construction, which gives a closer approach to simultaneous action of all the triple valves in a train than before. The local reductions of train pressure produced by the triple valve in the forward part of the train cause an earlier action of the rearward valves, and this results, as explained, in more nearly simultaneous braking effect being produced throughout the train in every case of first setting the brakes, with a smoother and more efficient brake service generally. A break-away or rupture in the hose coupling, or other accident causing an escape of air in the train pipe, immediately applies the brake, hence the use of the term "automatic."

The Vacuum Automatic Brake.

In the case of the Vacuum Automatic Brake, an ejector placed upon the engine exhausts the air out of the continuous pipe in the brake cylinders. The brake is applied by the admission of air into the train pipe and released by the withdrawal of the same through the ejector. It is continuous, each vehicle carrying its own brake cylinder, which is connected to a pipe running from end to end of the train, and it is through this pipe that the action of the brake cylinders is controlled. The brake can be applied by the guard, and is self-acting in the case of an accidental parting of the train or any damage happening to the brake itself.

The "ejector" consists in reality of two ejectors known as the "large" and "small," the latter being placed inside the former. The small one is worked continuously, and is controlled by the small screw steam valve shown just above the nozzles, this valve being adjusted to give the required vacuum. The large ejector is worked by the admission of steam through a lift valve, placed on the side of the ejector, and is opened by a cam on an extension of the spindle which carries the air disc, when the driver's handle is placed in the position marked "off." The action of both ejectors is the same, steam being admitted around the cones and passing through the ejector



Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Up Manchester-London express.
A "single" piloting a (Class 3) 4-4-0 locomotive.
Fitted with Vacuum automatic brake.

Digitized by Google

upwards, with war bonus for men with dependents. Free quarters, free passage, and liberal leave are offered. There is likewise a vacancy for a deputy stores superintendent on the Federated Malay States Railway. Intending applicants should carefuly read the advertisements, and in writing the Crown Agents for the Colonies, 4, Millbank, S.W.1, should mention the RAILWAY MAGAZINE.

* * *

MEMBERS of the Cambridge Railways Miniature Rifle Club enjoy the hearty support of Mr. E. Robinson, the Great Eastern Railway's popular District Commercial Superintendent, and his public-spirited predecessor, Mr. A. C. Hutcherson. At the recent distribution of prizes and certificates by Mr. Robinson, to Mr. Hutcherson was given the pleasant task of presenting the cup which, when he was its President, he kindly gave to the club. The Hutcherson Cup had been held in the two previous years by Mr. S. Hiner, but on this occasion the top-scorer was Mr. A. Smith (298 out of a possible 360), who also received the smaller cup given by the club. Mr. L. Lucock, the runner-up, who was only one point behind Mr. Smith, received a Bell Medal. Mr. Hutcherson cordially congratulated Mr. Smith and Mr. Lucock, and requested that the challenge cup should be filled and passed round among the company in order that they might drink the health of the winner. Preceding the before-mentioned function there was a shooting match at the rifle range between teams representing Liverpool Street and Cambridge, the former being captained by Capt. Mills and the latter by Mr. Buck. The result was a win for the visitors, the scores in the men's section being 722 to 640, and in the ladies' section 346 to 303.

* * *

THE General Electric Co., Ltd., desire to announce that they have completed the purchase of the Erith Works, and of the goodwill of the manufacturing business hitherto carried on by Messrs. Fraser and Chalmers, Ltd. Practically the whole of the personnel have transferred their services to the G.E.C., who will carry on the business as a going concern and under the title of Fraser and Chalmers Engineering Works.

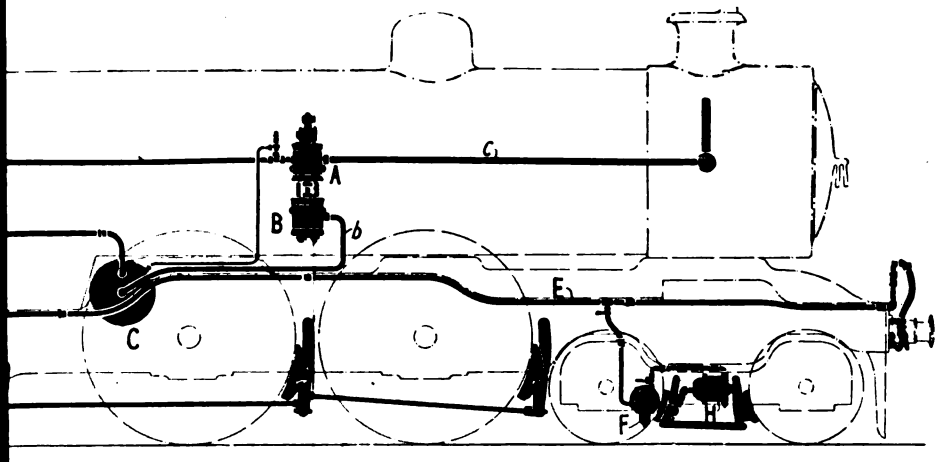
* * *

THE Royal Commission appointed to inquire into the working of the Queensland Railways in one part of its lengthy report makes the following remarks on efficiency: "One other test of efficiency we have applied—that is, the number of engine miles run per 100 train miles. From the year 1900-01 to the year 1909-10 from 115 to 118 engine miles were run per 100 train miles. From the year 1903 to 1910 it varied only from 117 to 118. That seems to have been a fairly constant factor, but for the years 1910-11 to 1916-17 there has been almost a constant increase, until in the last year under review 128 engine miles were run for every 100 train miles. It is difficult to say in any given case that the reason in that particular instance for running a light engine or other unproductive mileage is unsound, but it seems to us this is rather a serious matter, viewed as a whole. There were 10,738,253 train miles run in 1916-17. Had that traffic been run with only eighteen additional miles of engine miles per 100 train miles, as it was in the ten years preceding 1910, then the engine mileage would have been 1,141,115 miles less. The cost per mile of running an engine mile as distinguished from a train mile is not exactly ascertainable. In 1916-17 the locomotive working cost per engine mile was approximately 1s. 6.4d., and per train mile was 23.44d."

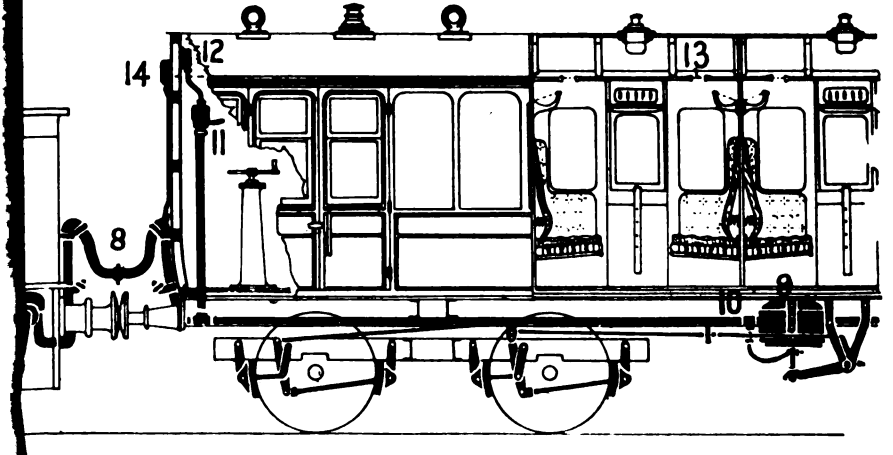
* * *

THE report of the Royal Commission on Queensland Railways contains much of interest in relation to the development and improvement of railway facilities in that State. It says: One factor which interferes with the economy of the construction of new railways, and of new work in connection with the existing railways, is having under way at one time construction at more points than the exigencies of the treasury will allow to be carried on in full swing. Our attention has been called in a number of instances to the work, some of very considerable importance, which on completion had been found to be unsuitable, in location or design. There seems to have been occasions when even the merest type of workman on the job was able to perceive unsuitability, and notwithstanding the plans are carried out because they are plans. Placing the responsibility on every employee in charge of the job would, we think, have a salutary effect. Regarding the Ipswich workshops, the report states that, generally speaking, the system of management, control and working of the workshops appeared to be well devised for efficient working and management. Respecting the construction of rolling stock, the Commission recommended that on lines of economical working, when any particular work had been commenced, it should be completed without interruption, as all concerns worked with better result when allowed to proceed at full swing than when diverted from one half-finished job to another.

Digitized by Google



-Triple Valve. G—Auxiliary Reservoirs.
team Piping.

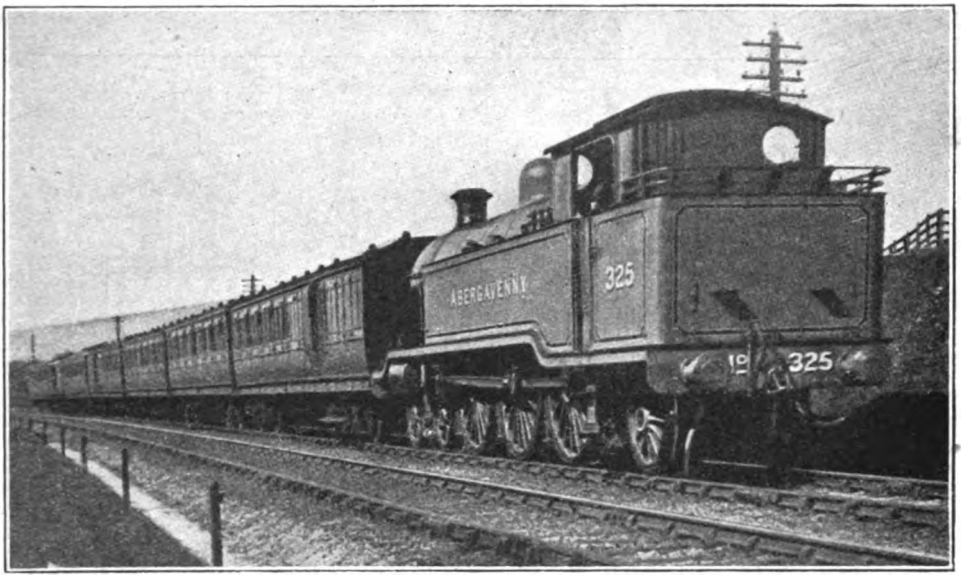


rap and Valve. 8—End Pipes and Couplings.
14—Air Valve.

CHART

Digitized by Google

Digitized by Google



Photo] [*R. W. T. Collins.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Down train hauled by 4-6-2 tank engine, No. 325, *Abergavenny*.
Fitted with Westinghouse Brake.

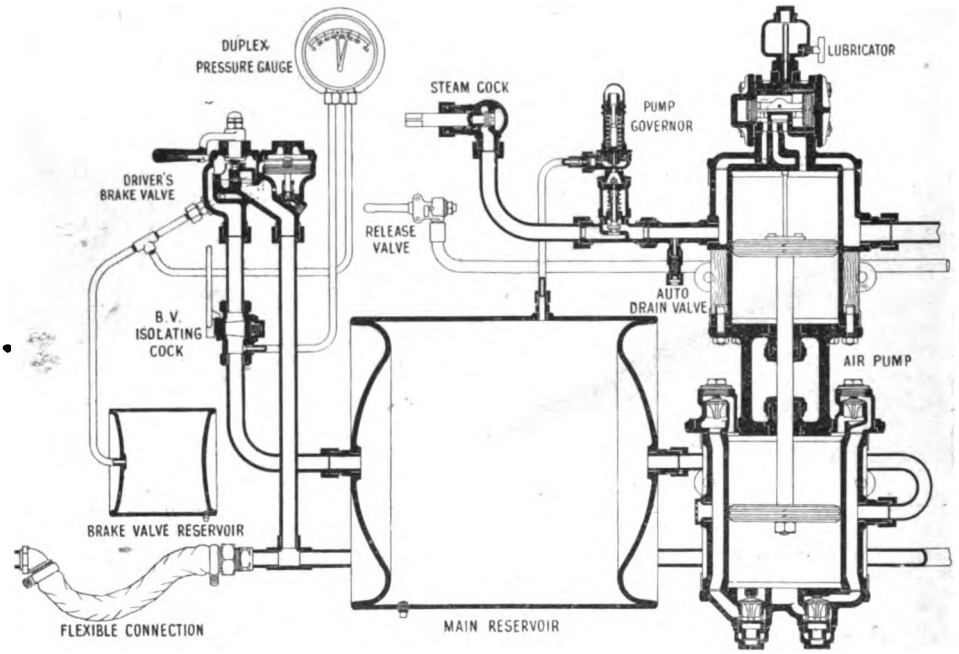
Automatic Continuous Brakes on Railways.

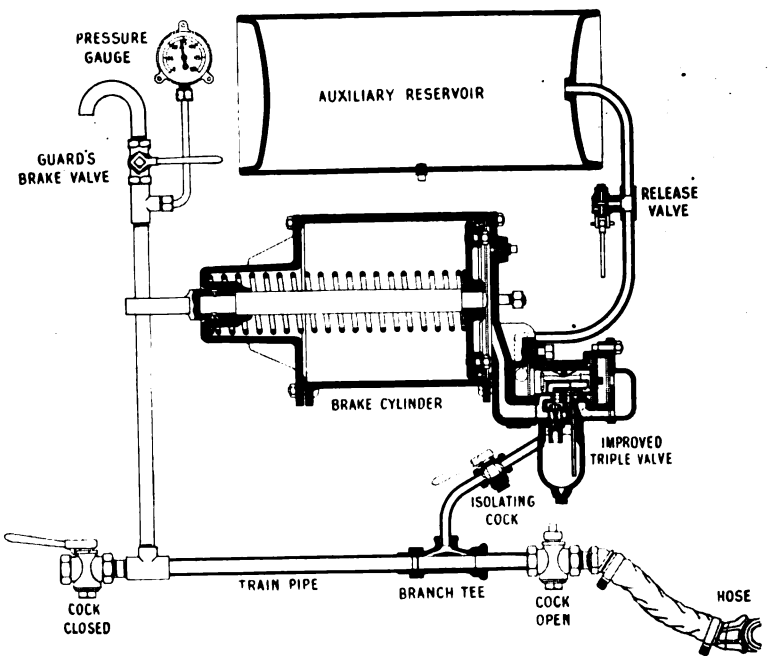
WHEN we think of speed on railways we concern ourselves mostly with the ability of the locomotive to overcome the obstacles in its path in the way of train resistance and the gradients encountered in the course of a run. The locomotive is undoubtedly the factor which counts in the building up and maintenance of speed, but a moment's reflection will suffice to remind us that without an adequate braking system speed would be impossible with safety; therefore, one of the first considerations in planning locomotives and rolling stock must be that of the ability to *stop* the trains as well as to accelerate them to the required speeds from a state of rest.

The evolution of brake apparatus on railways has passed through many phases. The earliest and crudest forms of hand-brakes long since gave way to improved mechanism of various kinds, some still operated by hand, others by steam, and others, again, by the use of compressed air, etc. The manipulation of a small handle in the driver's cab is sufficient to rapidly apply the brakes to all the vehicles throughout the train simultaneously and bring them to a state of rest in a very short space of time and distance even when running at the highest speeds, and to do this with certainty when called upon in an emergency to reduce or altogether stop the rate of progress of the train.

Every reader of the RAILWAY MAGAZINE will be familiar with the names, if not also with some of the details, of the two leading forms of brake mechanism employed in this and other countries. It will, however, no doubt, serve a useful purpose if we briefly enumerate the main features of each system and the principle upon which they operate in each case. The brakes referred to are the Westinghouse and the Vacuum. In the first case, with the Westinghouse the principle involved is that of charging the whole system with air compressed to any desired pressure, which air the triple valves automatically admit from the reservoirs to one side of the pistons in the brake cylin-

Digitized by Google





DETAILS OF THE WESTINGHOUSE BRAKE.

Digitized by Google

ders, when the pressure in the brake pipe is reduced, thereby moving these pistons within the brake cylinders. These pistons have attached to them lever-mechanism which conveys the pressure on the pistons to the brake blocks. The brakes are released by restoring the pressure in the brake pipe, thus automatically moving the triple valves to release to the atmosphere the pressure which they had previously admitted to the brake cylinders.

In the case of the Vacuum brake, the principle involved is that of the creation of a vacuum throughout the whole system, which vacuum is automatically retained in the brake cylinders on one side of the pistons by means of a valve when atmospheric pressure is admitted to the brake pipe and below the pistons, thereby actuating the pistons within the cylinders to apply the brakes, whilst for releasing them the vacuum is restored in the brake pipe and below the piston by removing the atmospheric pressure.

In either case, the manipulation of the "driver's valve" in the cab suffices to automatically apply or release the brakes from one end of the train to the other, whilst an additional means of application is provided in the guard's van or vans, no matter how the train may be made up.

The Westinghouse Brake.

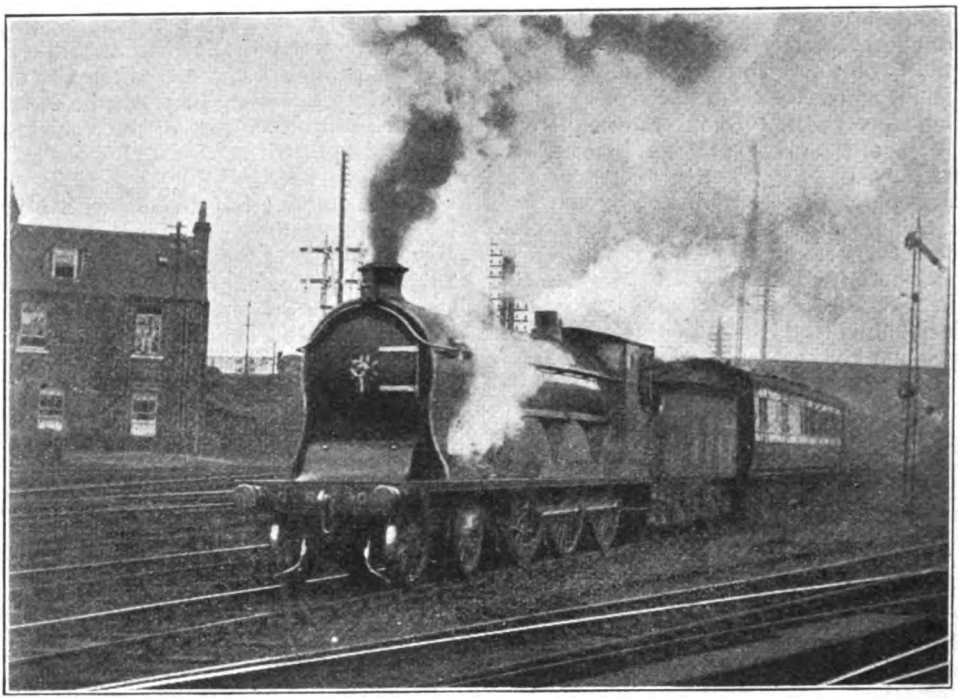
The Westinghouse brake is applied to locomotives and trains in two separate forms, namely, the "ordinary" automatic and the "quick-acting" brake apparatus. The accompanying diagram shows the general application of the mechanism to a locomotive and one coach. The essential parts of the apparatus are a brake cylinder (H), containing a piston with rod, attached to the brake gear in such a manner that the brakes are applied when the piston is forced out by air pressure; an auxiliary reservoir (G), in which air, supplied from the main reservoir through the main pipe, is stored, for applying the brake on its own vehicle; a triple valve (F), which automatically admits compressed air from the auxiliary reservoir (G) to the brake cylinder (H) whenever the air pressure in the main pipe is reduced, and discharges the pressure from the brake cylinder into the atmosphere when the original air pressure in the main pipe is restored.

A release valve (J) serves the purpose of releasing the brake by hand, if necessary. On locomotives and tenders these valves are fixed in the cab within easy reach of the driver; on carriages they are so arranged that they can be readily opened from either side of the vehicle by pulling a light wire connected to the valve handle.

The locomotive is provided with a vertical double-acting air-pump, having a steam cylinder (A) and an air cylinder (B), with the usual valves and pistons. The pump is driven by steam, which is drawn from the locomotive boiler, and, after having done its work, it is exhausted through the pipe (E) into the smoke-box, or disposed of in some other way. To regulate the flow of steam to the pump, and, consequently, to govern the work of the latter at the will of the driver, a steam cock (P) is so arranged that it can be closed or opened from the driver's cab. When the steam cock (P) is open the pump will work and force air through the delivery pipe into the main reservoir (C), usually fixed beneath the footplate. A separate pipe leads from the top part of the main reservoir (C) to the driver's brake valve (D), placed in the cab of the engine, within easy reach of the driver. This valve is also connected to the main brake pipe (E), which extends the whole length of the train, communicating with the brake apparatus on each vehicle through a branch pipe. Air-tight connections of the main pipe (E) between the vehicles of the train are formed by flexible rubber hose fitted with iron coupling heads (K), so designed that they may readily be coupled or uncoupled. Stop cocks (N) are placed in the main pipe at either end of each vehicle, in order to close the pipe at the ends of the trains, and to prevent the action of the brake when vehicles are detached.

The air pump (A B), driven by steam from the boiler of the locomotive, compresses air into a main reservoir (C) to a pressure of about 80 to 85 lb. per square inch, or in the case of the quick-acting apparatus, 90 to 95 lb. When the engine is coupled to the train, the compressed air in the main reservoir is turned into the main pipe (E), from which it also passes through the branch pipes, and fills on each vehicle an auxiliary reservoir (G). Thus the main pipe (E), the triple valves (F), and auxiliary reservoirs (G) are all charged with an equal pressure of about 70 lb., but there is no compressed air in

Digitized by Google



Photo] [*R. A. Chrystal.*

CALEDONIAN RAILWAY.
North express leaving Stirling.
4-6-0 locomotive, No. 906.
Fitted with Westinghouse Brake.

the brake cylinders (H) so long as the brake is not in operation.

The brakes are applied to all the vehicles in the train by a reduction of pressure, purposely or accidentally produced in the main pipe (E). In ordinary working this is effected by allowing air to escape by the driver's brake valve (D), but the same result follows on a train breaking in two, or on a rupture of an essential part of the apparatus on any vehicle.

If the air is allowed to exhaust slowly from the main pipe, as in an ordinary application of the brake, the Westinghouse quick-acting brake works in exactly the same manner as the Westinghouse ordinary brake. Each triple valve (F) then permits a portion of the compressed air stored in the auxiliary reservoir (G) to flow into the corresponding brake cylinder (H) and force its piston forward, pressing the brake blocks against the wheels by means of the gear connected to the piston rod. The brake force thus produced corresponds to the reduction of pressure in the main pipe (E); consequently the driver can graduate the action of the brake at will by regulating with the brake valve (D) the discharge of air from the pipe.

If, however, the air is rapidly discharged from the main pipe (E), as in an emergency application of the brake, this will cause a sudden reduction of the main-pipe pressure, and thereby instantly produce the rapid action of the brake. The triple valves (F) then not only allow compressed air from the auxiliary reservoirs to enter their brake cylinders (H), but, in addition, open on every vehicle a large communication, through which compressed air is also admitted from the main pipe (E) into the brake cylinders (H). It will easily be understood that a double advantage is hereby gained, first, in utilising a considerable portion of the air in the main pipe to increase the available brake force in cases of emergency, and, secondly, in producing a rapid reduction of pressure in the whole length of the main pipe, which accelerates the action of

Digitized by Google

the brake with extraordinary rapidity, and ensures practically simultaneous action throughout trains of almost any length.

The brakes are released by an increase of pressure in the main pipe, produced by admitting air from the main reservoir (C) through the driver's brake valve (D) into the main pipe (E). This restores the pressure in the main pipe, and causes the triple valves (F) to discharge the air from the brake cylinders (H) into the atmosphere, thus relieving the brake blocks from pressure. At the same time the auxiliary reservoirs (G) are re-charged.

The design of the triple valve has been much improved in its latest form, the principal improvement relating to the construction, which gives a closer approach to simultaneous action of all the triple valves in a train than before. The local reductions of train pressure produced by the triple valve in the forward part of the train cause an earlier action of the rearward valves, and this results, as explained, in more nearly simultaneous braking effect being produced throughout the train in every case of first setting the brakes, with a smoother and more efficient brake service generally. A break-away or rupture in the hose coupling, or other accident causing an escape of air in the train pipe, immediately applies the brake, hence the use of the term "automatic."

The Vacuum Automatic Brake.

In the case of the Vacuum Automatic Brake, an ejector placed upon the engine exhausts the air out of the continuous pipe in the brake cylinders. The brake is applied by the admission of air into the train pipe and released by the withdrawal of the same through the ejector. It is continuous, each vehicle carrying its own brake cylinder, which is connected to a pipe running from end to end of the train, and it is through this pipe that the action of the brake cylinders is controlled. The brake can be applied by the guard, and is self-acting in the case of an accidental parting of the train or any damage happening to the brake itself.

The "ejector" consists in reality of two ejectors known as the "large" and "small," the latter being placed inside the former. The small one is worked continuously, and is controlled by the small screw steam valve shown just above the nozzles, this valve being adjusted to give the required vacuum. The large ejector is worked by the admission of steam through a lift valve, placed on the side of the ejector, and is opened by a cam on an extension of the spindle which carries the air disc, when the driver's handle is placed in the position marked "off." The action of both ejectors is the same, steam being admitted around the cones and passing through the ejector

Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Up Manchester-London express.
A "single" piloting a (Class 3) 4-4-0 locomotive.
Fitted with Vacuum automatic brake.

Digitized by Google

upwards, with war bonus for men with dependents. Free quarters, free passage, and liberal leave are offered. There is likewise a vacancy for a deputy stores superintendent on the Federated Malay States Railway. Intending applicants should carefuly read the advertisements, and in writing the Crown Agents for the Colonies, 4, Millbank, S.W.1, should mention the RAILWAY MAGAZINE.

* * *

MEMBERS of the Cambridge Railways Miniature Rifle Club enjoy the hearty support of Mr. E. Robinson, the Great Eastern Railway's popular District Commercial Superintendent, and his public-spirited predecessor, Mr. A. C. Hutcherson. At the recent distribution of prizes and certificates by Mr. Robinson, to Mr. Hutcherson was given the pleasant task of presenting the cup which, when he was its President, he kindly gave to the club. The Hutcherson Cup had been held in the two previous years by Mr. S. Hiner, but on this occasion the top-scorer was Mr. A. Smith (298 out of a possible 360), who also received the smaller cup given by the club. Mr. L. Lucock, the runner-up, who was only one point behind Mr. Smith, received a Bell Medal. Mr. Hutcherson cordially congratulated Mr. Smith and Mr. Lucock, and requested that the challenge cup should be filled and passed round among the company in order that they might drink the health of the winner. Preceding the before-mentioned function there was a shooting match at the rifle range between teams representing Liverpool Street and Cambridge, the former being captained by Capt. Mills and the latter by Mr. Buck. The result was a win for the visitors, the scores in the men's section being 722 to 640, and in the ladies' section 346 to 303.

* * *

THE General Electric Co., Ltd., desire to announce that they have completed the purchase of the Erith Works, and of the goodwill of the manufacturing business hitherto carried on by Messrs. Fraser and Chalmers, Ltd. Practically the whole of the personnel have transferred their services to the G.E.C., who will carry on the business as a going concern and under the title of Fraser and Chalmers Engineering Works.

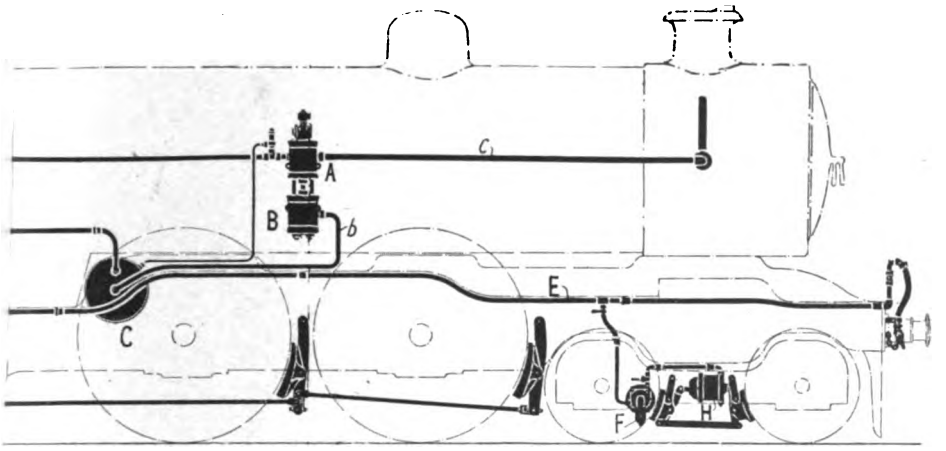
* * *

THE Royal Commission appointed to inquire into the working of the Queensland Railways in one part of its lengthy report makes the following remarks on efficiency: "One other test of efficiency we have applied—that is, the number of engine miles run per 100 train miles. From the year 1900-01 to the year 1909-10 from 115 to 118 engine miles were run per 100 train miles. From the year 1903 to 1910 it varied only from 117 to 118. That seems to have been a fairly constant factor, but for the years 1910-11 to 1916-17 there has been almost a constant increase, until in the last year under review 128 engine miles were run for every 100 train miles. It is difficult to say in any given case that the reason in that particular instance for running a light engine or other unproductive mileage is unsound, but it seems to us this is rather a serious matter, viewed as a whole. There were 10,738,253 train miles run in 1916-17. Had that traffic been run with only eighteen additional miles of engine miles per 100 train miles, as it was in the ten years preceding 1910, then the engine mileage would have been 1,141,115 miles less. The cost per mile of running an engine mile as distinguished from a train mile is not exactly ascertainable. In 1916-17 the locomotive working cost per engine mile was approximately 1s. 6.4d., and per train mile was 23.44d."

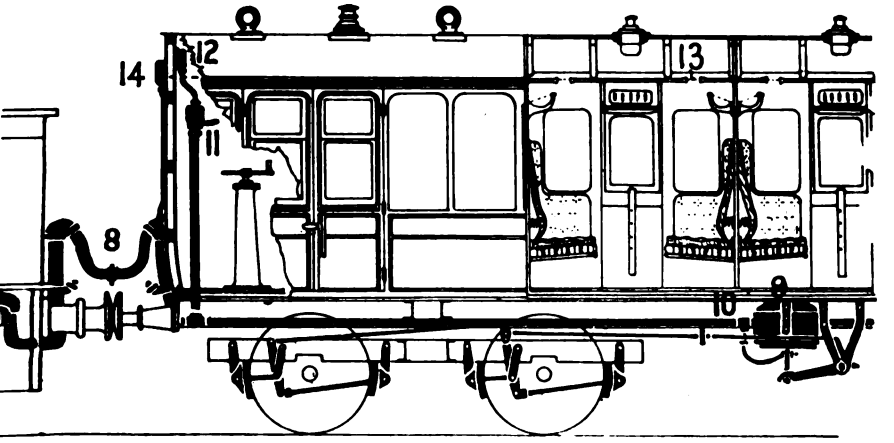
* * *

THE report of the Royal Commission on Queensland Railways contains much of interest in relation to the development and improvement of railway facilities in that State. It says: One factor which interferes with the economy of the construction of new railways, and of new work in connection with the existing railways, is having under way at one time construction at more points than the exigencies of the treasury will allow to be carried on in full swing. Our attention has been called in a number of instances to the work, some of very considerable importance, which on completion had been found to be unsuitable, in location or design. There seems to have been occasions when even the merest type of workman on the job was able to perceive unsuitability, and notwithstanding the plans are carried out because they are plans. Placing the responsibility on every employee in charge of the job would, we think, have a salutary effect. Regarding the Ipswich workshops, the report states that, generally speaking, the system of management, control and working of the workshops appeared to be well devised for efficient working and management. Respecting the construction of rolling stock, the Commission recommended that on lines of economical working, when any particular work had been commenced, it should be completed without interruption, as all concerns worked with better result when allowed to proceed at full swing than when diverted from one half-finished job to another.

Digitized by Google



-Triple Valve. G—Auxiliary Reservoirs.
team Piping.



ap and Valve. 8—End Pipes and Couplings.
14—Air Valve.

HART

Digitized by Google

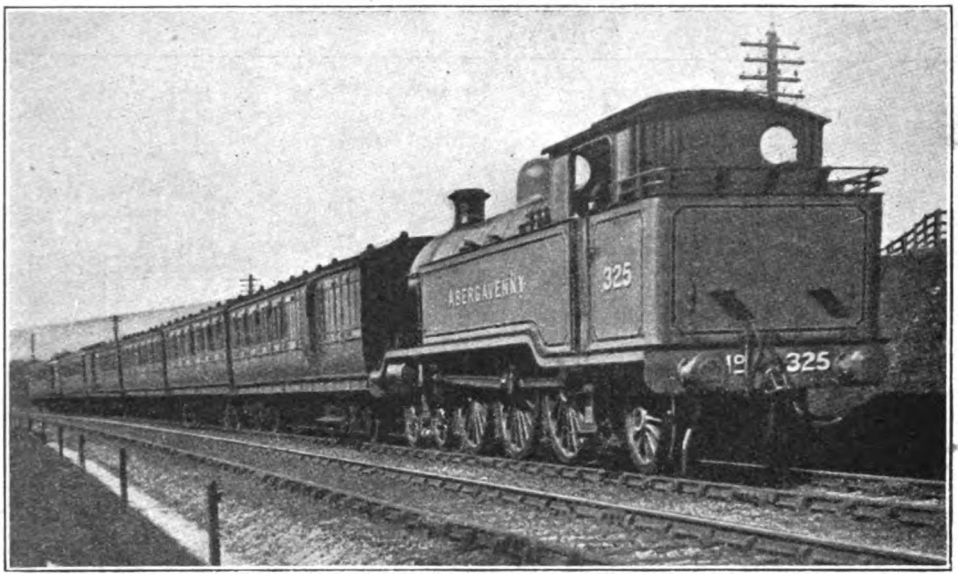
upw
pend
liber
vaca
the I
ing
tisen
for t
ment

M
ture
Mr. I
popu
dent,
A. C
of pr
Mr.
of pr
Presi
Hutc
previ
occa
(298
the
Luco
point
Med
lated
quest
and
order
winn
funct
rifle
pool
capt
Mr. I
tors,
722
303.

T
anno
chas
of th
on b
Pract
trans
will
and
Engi

T
into
in or
follo
test
numb
miles

Digitized by Google



Photo] [*R. W. T. Collins.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Down train hauled by 4-6-2 tank engine, No. 325, *Abergavenny*.
Fitted with Westinghouse Brake.

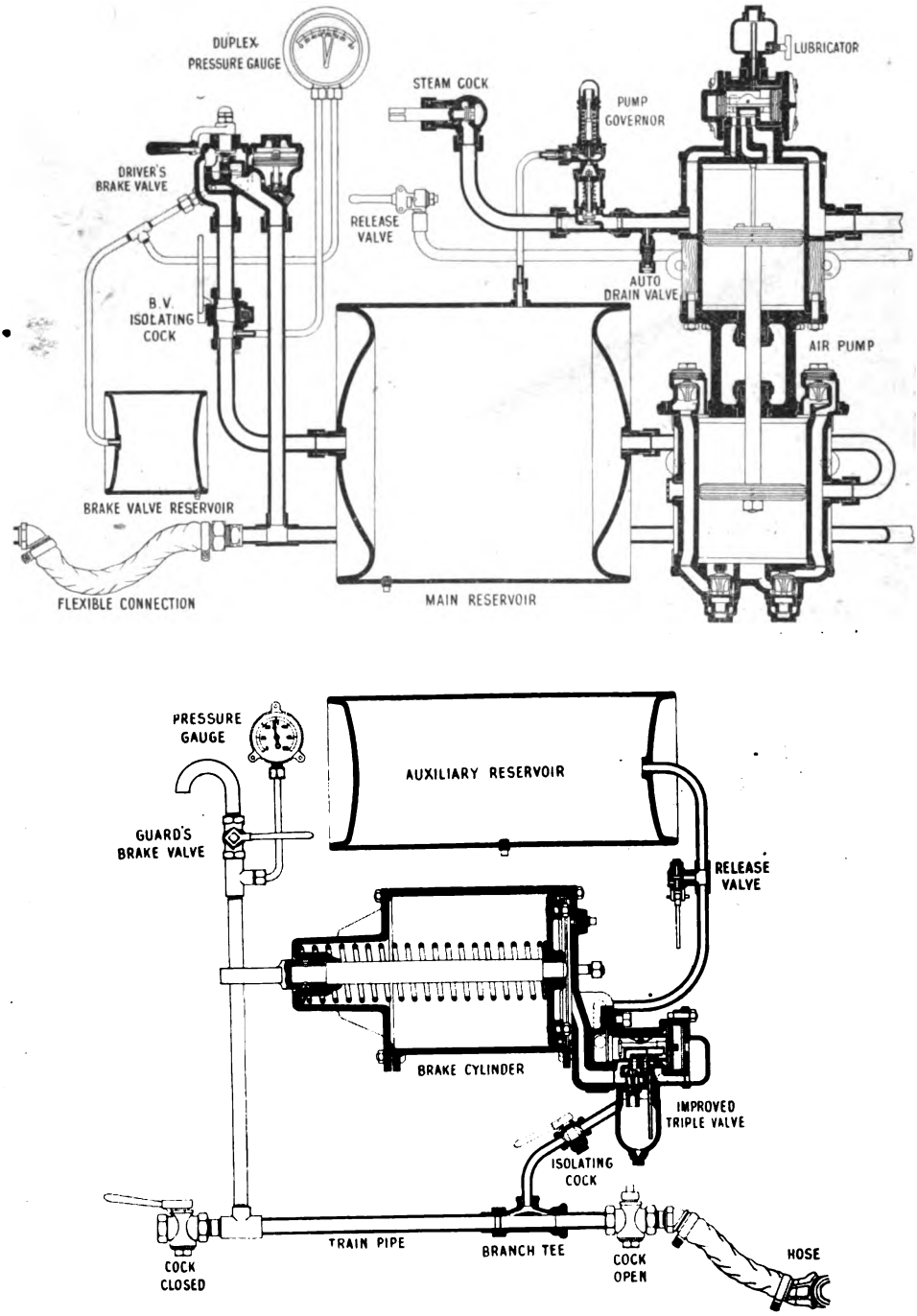
Automatic Continuous Brakes on Railways.

WHEN we think of speed on railways we concern ourselves mostly with the ability of the locomotive to overcome the obstacles in its path in the way of train resistance and the gradients encountered in the course of a run. The locomotive is undoubtedly the factor which counts in the building up and maintenance of speed, but a moment's reflection will suffice to remind us that without an adequate braking system speed would be impossible with safety; therefore, one of the first considerations in planning locomotives and rolling stock must be that of the ability to *stop* the trains as well as to accelerate them to the required speeds from a state of rest.

The evolution of brake apparatus on railways has passed through many phases. The earliest and crudest forms of hand-brakes long since gave way to improved mechanism of various kinds, some still operated by hand, others by steam, and others, again, by the use of compressed air, etc. The manipulation of a small handle in the driver's cab is sufficient to rapidly apply the brakes to all the vehicles throughout the train simultaneously and bring them to a state of rest in a very short space of time and distance even when running at the highest speeds, and to do this with certainty when called upon in an emergency to reduce or altogether stop the rate of progress of the train.

Every reader of the RAILWAY MAGAZINE will be familiar with the names, if not also with some of the details, of the two leading forms of brake mechanism employed in this and other countries. It will, however, no doubt, serve a useful purpose if we briefly enumerate the main features of each system and the principle upon which they operate in each case. The brakes referred to are the Westinghouse and the Vacuum. In the first case, with the Westinghouse the principle involved is that of charging the whole system with air compressed to any desired pressure, which air the triple valves automatically admit from the reservoirs to one side of the pistons in the brake cylin-

Digitized by Google



DETAILS OF THE WESTINGHOUSE BRAKE.

Digitized by Google

ders, when the pressure in the brake pipe is reduced, thereby moving these pistons within the brake cylinders. These pistons have attached to them lever-mechanism which conveys the pressure on the pistons to the brake blocks. The brakes are released by restoring the pressure in the brake pipe, thus automatically moving the triple valves to release to the atmosphere the pressure which they had previously admitted to the brake cylinders.

In the case of the Vacuum brake, the principle involved is that of the creation of a vacuum throughout the whole system, which vacuum is automatically retained in the brake cylinders on one side of the pistons by means of a valve when atmospheric pressure is admitted to the brake pipe and below the pistons, thereby actuating the pistons within the cylinders to apply the brakes, whilst for releasing them the vacuum is restored in the brake pipe and below the piston by removing the atmospheric pressure.

In either case, the manipulation of the "driver's valve" in the cab suffices to automatically apply or release the brakes from one end of the train to the other, whilst an additional means of application is provided in the guard's van or vans, no matter how the train may be made up.

The Westinghouse Brake.

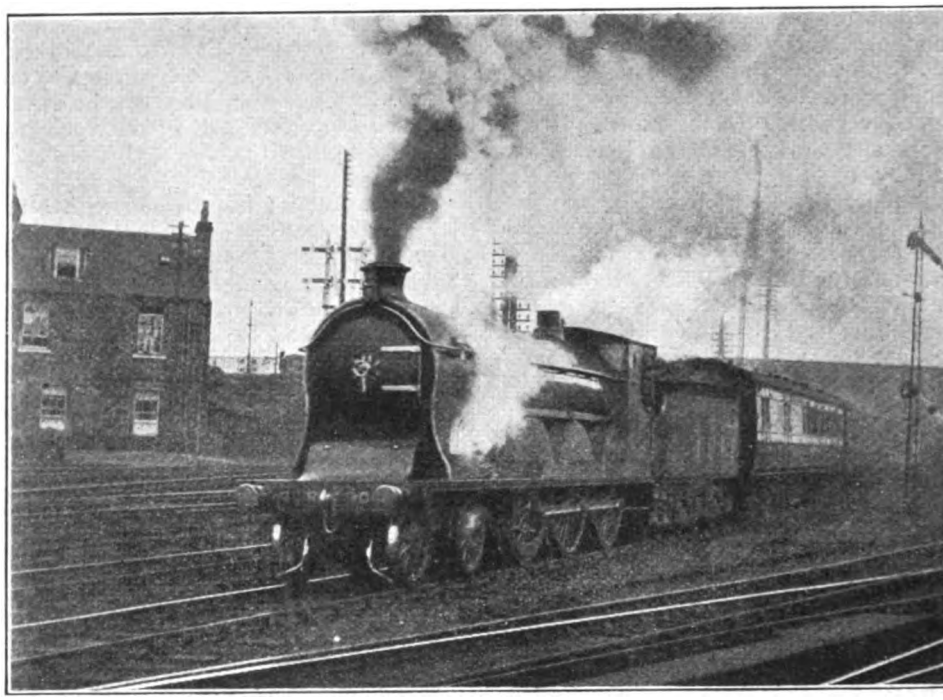
The Westinghouse brake is applied to locomotives and trains in two separate forms, namely, the "ordinary" automatic and the "quick-acting" brake apparatus. The accompanying diagram shows the general application of the mechanism to a locomotive and one coach. The essential parts of the apparatus are a brake cylinder (H), containing a piston with rod, attached to the brake gear in such a manner that the brakes are applied when the piston is forced out by air pressure; an auxiliary reservoir (G), in which air, supplied from the main reservoir through the main pipe, is stored, for applying the brake on its own vehicle; a triple valve (F), which automatically admits compressed air from the auxiliary reservoir (G) to the brake cylinder (H) whenever the air pressure in the main pipe is reduced, and discharges the pressure from the brake cylinder into the atmosphere when the original air pressure in the main pipe is restored.

A release valve (J) serves the purpose of releasing the brake by hand, if necessary. On locomotives and tenders these valves are fixed in the cab within easy reach of the driver; on carriages they are so arranged that they can be readily opened from either side of the vehicle by pulling a light wire connected to the valve handle.

The locomotive is provided with a vertical double-acting air-pump, having a steam cylinder (A) and an air cylinder (B), with the usual valves and pistons. The pump is driven by steam, which is drawn from the locomotive boiler, and, after having done its work, it is exhausted through the pipe (E) into the smoke-box, or disposed of in some other way. To regulate the flow of steam to the pump, and, consequently, to govern the work of the latter at the will of the driver, a steam cock (P) is so arranged that it can be closed or opened from the driver's cab. When the steam cock (P) is open the pump will work and force air through the delivery pipe into the main reservoir (C), usually fixed beneath the footplate. A separate pipe leads from the top part of the main reservoir (C) to the driver's brake valve (D), placed in the cab of the engine, within easy reach of the driver. This valve is also connected to the main brake pipe (E), which extends the whole length of the train, communicating with the brake apparatus on each vehicle through a branch pipe. Air-tight connections of the main pipe (E) between the vehicles of the train are formed by flexible rubber hose fitted with iron coupling heads (K), so designed that they may readily be coupled or uncoupled. Stop cocks (N) are placed in the main pipe at either end of each vehicle, in order to close the pipe at the ends of the trains, and to prevent the action of the brake when vehicles are detached.

The air pump (A B), driven by steam from the boiler of the locomotive, compresses air into a main reservoir (C) to a pressure of about 80 to 85 lb. per square inch, or in the case of the quick-acting apparatus, 90 to 95 lb. When the engine is coupled to the train, the compressed air in the main reservoir is turned into the main pipe (E), from which it also passes through the branch pipes, and fills on each vehicle an auxiliary reservoir (G). Thus the main pipe (E), the triple valves (F), and auxiliary reservoirs (G) are all charged with an equal pressure of about 70 lb., but there is no compressed air in

Digitized by Google



Photo] [*R. A. Chrystal.*

CALEDONIAN RAILWAY.
North express leaving Stirling.
4-6-0 locomotive, No. 906.
Fitted with Westinghouse Brake.

the brake cylinders (H) so long as the brake is not in operation.

The brakes are applied to all the vehicles in the train by a reduction of pressure, purposely or accidentally produced in the main pipe (E). In ordinary working this is effected by allowing air to escape by the driver's brake valve (D), but the same result follows on a train breaking in two, or on a rupture of an essential part of the apparatus on any vehicle.

If the air is allowed to exhaust slowly from the main pipe, as in an ordinary application of the brake, the Westinghouse quick-acting brake works in exactly the same manner as the Westinghouse ordinary brake. Each triple valve (F) then permits a portion of the compressed air stored in the auxiliary reservoir (G) to flow into the corresponding brake cylinder (H) and force its piston forward, pressing the brake blocks against the wheels by means of the gear connected to the piston rod. The brake force thus produced corresponds to the reduction of pressure in the main pipe (E); consequently the driver can graduate the action of the brake at will by regulating with the brake valve (D) the discharge of air from the pipe.

If, however, the air is rapidly discharged from the main pipe (E), as in an emergency application of the brake, this will cause a sudden reduction of the main-pipe pressure, and thereby instantly produce the rapid action of the brake. The triple valves (F) then not only allow compressed air from the auxiliary reservoirs to enter their brake cylinders (H), but, in addition, open on every vehicle a large communication, through which compressed air is also admitted from the main pipe (E) into the brake cylinders (H). It will easily be understood that a double advantage is hereby gained, first, in utilising a considerable portion of the air in the main pipe to increase the available brake force in cases of emergency, and, secondly, in producing a rapid reduction of pressure in the whole length of the main pipe, which accelerates the action of

Digitized by Google

the brake with extraordinary rapidity, and ensures practically simultaneous action throughout trains of almost any length.

The brakes are released by an increase of pressure in the main pipe, produced by admitting air from the main reservoir (C) through the driver's brake valve (D) into the main pipe (E). This restores the pressure in the main pipe, and causes the triple valves (F) to discharge the air from the brake cylinders (H) into the atmosphere, thus relieving the brake blocks from pressure. At the same time the auxiliary reservoirs (G) are re-charged.

The design of the triple valve has been much improved in its latest form, the principal improvement relating to the construction, which gives a closer approach to simultaneous action of all the triple valves in a train than before. The local reductions of train pressure produced by the triple valve in the forward part of the train cause an earlier action of the rearward valves, and this results, as explained, in more nearly simultaneous braking effect being produced throughout the train in every case of first setting the brakes, with a smoother and more efficient brake service generally. A break-away or rupture in the hose coupling, or other accident causing an escape of air in the train pipe, immediately applies the brake, hence the use of the term "automatic."

The Vacuum Automatic Brake.

In the case of the Vacuum Automatic Brake, an ejector placed upon the engine exhausts the air out of the continuous pipe in the brake cylinders. The brake is applied by the admission of air into the train pipe and released by the withdrawal of the same through the ejector. It is continuous, each vehicle carrying its own brake cylinder, which is connected to a pipe running from end to end of the train, and it is through this pipe that the action of the brake cylinders is controlled. The brake can be applied by the guard, and is self-acting in the case of an accidental parting of the train or any damage happening to the brake itself.

The "ejector" consists in reality of two ejectors known as the "large" and "small," the latter being placed inside the former. The small one is worked continuously, and is controlled by the small screw steam valve shown just above the nozzles, this valve being adjusted to give the required vacuum. The large ejector is worked by the admission of steam through a lift valve, placed on the side of the ejector, and is opened by a cam on an extension of the spindle which carries the air disc, when the driver's handle is placed in the position marked "off." The action of both ejectors is the same, steam being admitted around the cones and passing through the ejector

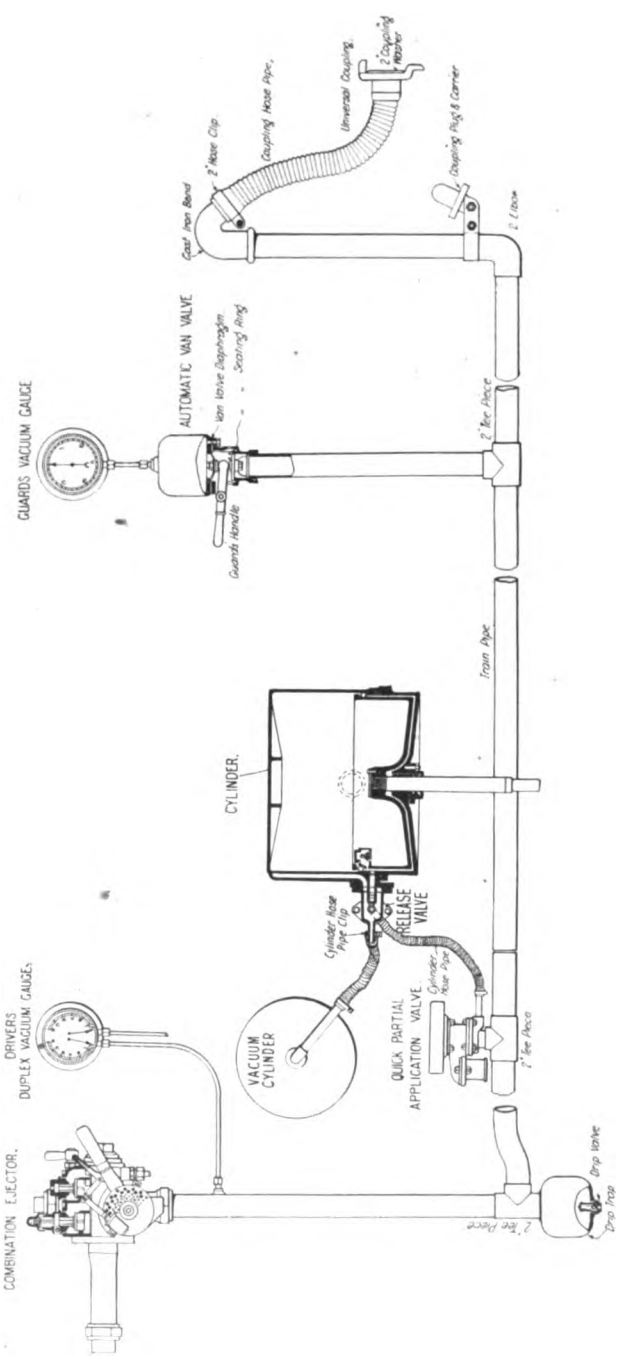
Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Up Manchester-London express.
A "single" piloting a (Class 3) 4-4-0 locomotive.
Fitted with Vacuum automatic brake.

Digitized by Google

AUTOMATIC CONTINUOUS BRAKES ON RAILWAYS.



DETAILS OF THE VACUUM AUTOMATIC BRAKE.

Digitized by Google

barrel at a great velocity, withdrawing the air from the train pipe and cylinders, and carrying it along the exhaust pipe into the chimney of the locomotive.

The driver's handle on the application valve has three positions, "off" being the position when it is required to release the brake quickly, and in which position steam is admitted to the large ejector. In "running position," the large ejector steam valve and air valves are both closed, and the brake is released slowly by the small ejector only, and the vacuum also maintained after the brake is released. "On" is the position for applying the brake fully, and, the air valve being open, the air passes through the holes in the disc and applies the brake. The movement between "running position" and "on" is for regulating the brake by letting in more or less air to apply or increase the power after application, or to withdraw the air to release or diminish the power on the blocks.

The engine having been coupled to the train, and the hose couplings connected between the tender and train and also between the coaches, and the one at the end of the train having been placed upon the plug or stop fixed upon the end of the vehicle, the driver admits steam to the small ejector, which soon exhausts the train pipe and cylinders, to a vacuum of from 20 to 24 in., or the large ejector may be used if the vacuum is required to be obtained more rapidly. The small ejector must be kept at work continuously to maintain the vacuum.

To apply the brake, the driver moves the handle of the combination ejector in the direction marked "on," thus admitting air to the train pipe and to the bottom of each cylinder, which lifts the pistons and so pulls the blocks on to the wheels. The air cannot pass to the top of the piston, as it is prevented by the ball valve and a rolling ring. The power of the application is controlled by the amount of air let into the continuous pipe.

To release the brake, the handle is returned to "running position," when the air let in to apply the brake is removed through the small ejector; or it may be released more quickly by pushing the handle in the direction marked "off," and so admitting steam to the large ejector.

The brake having been applied, the pressure of the blocks on the wheels may be increased or diminished at will without removing them, and also without reducing the full reserve power of the brake, which is always at command for an emergency stop.

A small auxiliary pipe is carried from the ejector by the side of the train pipe, and is connected only to the engine and tender vacuum chamber. This pipe is in communication with the small ejector when the driver's handle is in "full on" position, and thereby constantly maintains the vacuum on the top of the engine and tender pistons. At the top of this pipe is fixed a small valve, by opening which the brake can be released on the engine and tender after the steam to the ejector has been closed.

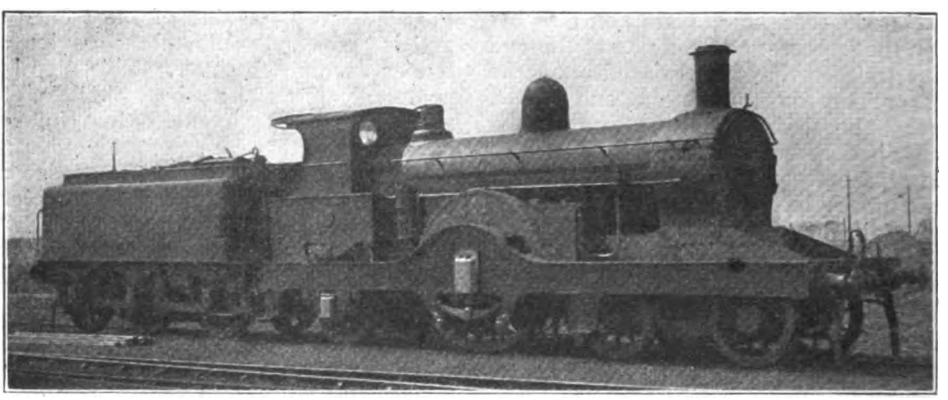
Digitized by Google

Locomotive and Train Working in the latter part of the 19th Century.

GREAT EASTERN RAILWAY. [No. VI.]

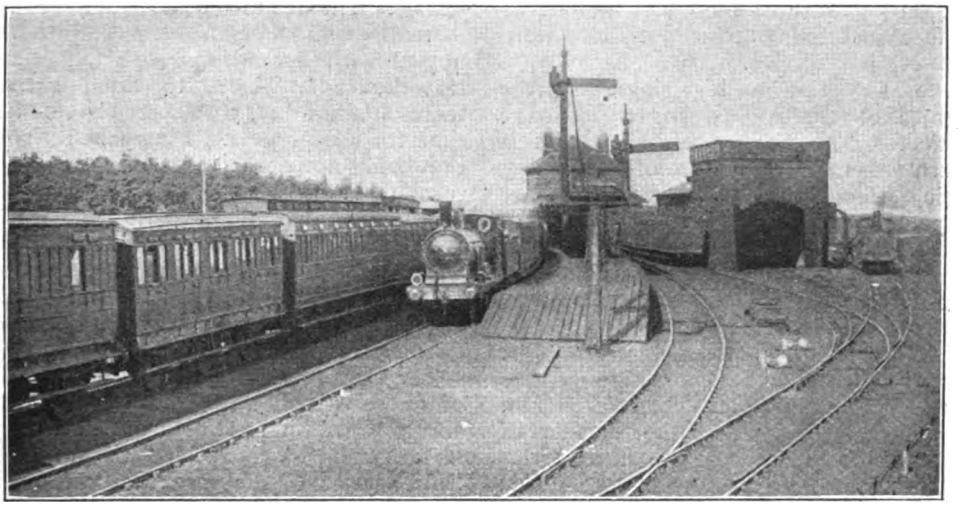
By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

ANY account of the Great Eastern locomotive work, however superficial, would be incomplete without some reference to the fairly extended application of oil burning which was so successfully used for some years on this line. Oil burning in locomotives was by no means new, and a British engineer, Mr. Urquhart, then in the service of the Russian railways, had, between 1882 and 1889, gradually evolved a very successful system of burning petroleum refuse, which was put to extensive use in Russia. In Mr. Urquhart's system petroleum was used alone, and other fuels were discarded. On the Great Eastern the problem was attacked from a different standpoint. The fuel used was tar from the Great Eastern oil gas works, which was then a waste product, but as other sources of this tar would have to be found if sufficient oil-burning engines were put into service, it had always to be kept in view that the supply of liquid fuel might fail at any moment, or that if engines were fitted for the burning of liquid fuel only, as in Urquhart's method, the price of this fuel might rise too greatly. The Great Eastern engines were, therefore, arranged to burn coal if required, or a combination of coal and liquid fuel. It is not my intention to go at any length into the technical description of the apparatus used. It is well known to most of the engineering readers of the RAILWAY MAGAZINE, and others interested can find full particulars in many of the technical journals published between 1893 and 1903. Suffice it to say, that the firebox was fitted with burners which sprayed oil supplied from a tank on the tender over a thin layer of coal fire. Steam was first raised in the boiler by a wood and coal fire in the ordinary manner, and when about 30-lb. pressure was attained on the gauge, the fire was levelled over and covered with a layer of



SINGLE EXPRESS ENGINE, NO. 11.
(Series 10-19). Built at Stratford, 1898, by Mr. James Holden.
Driving wheels, 7 ft.; cylinders, 18 in. by 26 in.

Digitized by Google



CROMER STATION IN 1900.

small pieces of broken firebrick. A few pieces of wood were thrown in to start a flame, and then the oil sprayed into the box by steam jet burners.

After various experiments had been made, and some suburban tank engines fitted, the system was gradually applied to several express engines, of which the Bromley single No. 251 was the first. Afterwards the 7-ft. 2-4-0 engines (710 class) Nos. 712 and 759 to 767, were fitted, also the single engines, 1004 to 1009, to work the Cromer expresses. Finally, there came the fine and handsome 4-2-2 singles, built in 1898, Nos. 10 to 19, to be mentioned shortly.

The late Mr. Rous-Marten made some trips on the Cromer expresses when 1004 to 1009 were working them, and in his bulletin to the International Railway Congress of 1898 reported as follows:—"These liquid-fuel burning single-wheelers do admirable work. They are also economical in fuel consumption, as the driver can regulate to a nicety the strength of the fire needed to keep up his steam pressure to just under blowing-off point. That point, 160 lb., is seldom allowed to be reached by these engines, the driver being able to maintain steam at 159 lb. without permitting any steam to be wasted through the safety valves. This materially makes for economy, and so does the improved cleanliness and absence of dust and grit on the footplate and on the machinery. The number of liquid-fuel burning engines is being steadily increased by Mr. Holden, but it may be open to question whether the fuel itself will continue to be obtainable in sufficiently large quantities at a price low enough to enable the present small average cost to be maintained. Consequently, it is doubtful whether the system can be indefinitely extended save at an augmented working cost. Within its present limits it is an unquestionable success."

I have quoted the above *in extenso* because it so clearly shows the position of matters as regards the burning of liquid fuel in this country. Some years after the above was written the "economic" effects predicted by the writer came to pass. The "law of supply and demand"—which may be defined as a polite way of expressing the old adage, "Each man for himself and the devil take the hindmost"—stepped in and spoiled matters. When the owners of refuse tar and other evil-smelling waste hydrocarbons came to the conclusion that there was much money to be made out of things that they once used to give away very cheerfully, they put the price up until liquid-fuel burning could no longer hold its own with ordinary coal burning. And so regretfully the fittings had to be removed from the engines and put by for that millenial day when every man will be only too glad to help his neighbour to do some good to the community—without charging too much in the process.

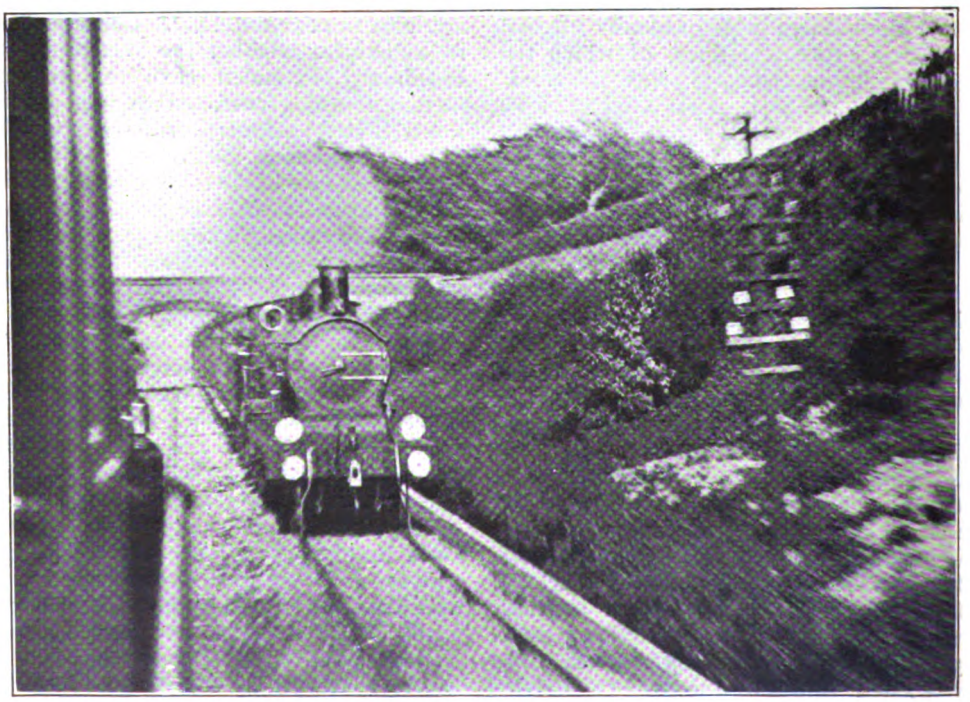
Digitized by Google

I am not sure of the exact number of engines so fitted, but in 1901 there were 58 in regular service.

The new oil-burning single express engines of 1898, Nos. 10 to 19, were particularly handsome, and in them a return was made to the use of the leading bogie, which had been discarded since 1885 on the Great Eastern. The engines bore a considerable resemblance to Mr. Johnson's fine engines on the Midland, in that they had double frames. The chimneys were improved in shape, and were provided with ornamental copper tops. Nos. 10 to 19 had 7-ft. single driving wheels, 18 in. by 26 in. cylinders, 160-lb. pressure, and a total heating surface of 1,293 sq. ft. They were put into service on the Cromer express trains, of which something may now be said.

The Cromer district is one of England's beauty spots, where a peaceful holiday may be spent with much advantage. The Great Eastern station stands somewhat outside the town, and is perched upon the top of a hill, to which only a psalmist or a member of an Alpine club could do justice. The beauties of its situation—for it really commands a very fine view—appeal with special force to the weary traveller who wishes to catch a train there on a hot day, with somewhat limited time for the process. I suppose its position could not be helped, since the structural make-up of the scenery absolutely precluded any suitable gradient for a descent into the town, so that the Great Eastern must often have cast longing eyes on the low-lying station of its Midland and Great Northern rivals, whose line reaches Cromer along the coast from the west.

The Great Eastern saw the possibilities of Cromer, and with the characteristic energy which it has for years devoted to its seaside traffic, decided to put on a train service of the very first class. In 1896 the through expresses were started, at first with a stop at Ipswich, which was afterwards omitted—the following year if I am not mistaken. The time in 1897 for the 131 miles to North Walsham, the first stop from Liverpool Street, was 2 hr. 40 min. This represented an average of nearly 49 miles an hour, but express run-



UP CROMER EXPRESS IN 1900.

Engine No. 12.

Photographed from the footplate of the corresponding down Cromer express.

Digitized by Google

ning beyond Trowse Junction presented very great difficulties, so that it is fair to consider the run as between the starting point and Trowse—114 miles—which was booked at 51 miles per hour. The trains, of which the down express left London at 1.30 p.m., and the up express departed from Cromer at 1.0 p.m., were particularly heavy, and it may be interesting to append the company's official figures of the detailed maximum summer weights as they ran at the end of the 19th century :—

		T.	C.	Q.
1	six-wheeled brake van	12	11	0
2	do. 3rd class coaches ...	26	18	0
2	do. do. do. ...	26	12	0
1	do. 1st class coach	13	15	2¼
1	eight-wheeled 1st class corridor car.	23	5	2
1	do. dining car...	29	8	2
1	do. 3rd class corridor car	27	10	1
1	do. composite coach ...	21	4	0
1	six-wheeled 1st class coach	13	15	2¼
1	do. 3rd class coach	13	9	0
1	do. brake van	12	11	0
1	do. composite coach... ...	13	19	2½
1	do. 3rd class coach	13	9	0
1	do. composite brake van...	14	3	0
1	fruit van	8	5	0
	Total weight empty	270	17	0

As mentioned previously, the single engines 1004 to 1006 at Norwich, and 1007 to 1009 at Ipswich, worked these trains until 1898, when Nos. 12 to 15, the new 4-2-2 singles, were sent to Ipswich and Nos. 16 to 19 to Norwich for that purpose. Owing to the weight (19 tons) on the driving wheels, they were restricted to the coast road, and did not run over the Cambridge section. Nos. 10 and 11 remained at Stratford.

The engine working was somewhat unusual. The Ipswich engines on Mondays, Wednesdays, and Fridays worked the 10.0 a.m. from Ipswich to London, came down on the through Cromer express leaving London at 1.30 p.m., reaching Cromer at 4.25 p.m., and finished the day with a slow train, the 5.30 p.m. Cromer to Norwich, where the engine was stabled for the night and the men lodged out. On the same three days the Norwich men worked the 9.5 a.m. from Norwich to Cromer, then ran the through express which left Cromer at 1.0 p.m. for London, and came down to Ipswich with the 5.30 p.m. from Liverpool Street. At Ipswich they in their turn stabled their engine for the night. On the other three days the working was reversed, so that, in so far as the Cromer service was concerned, both Ipswich and Norwich engines had exactly the same trains.

This method of working led to a healthy and, from an outsider's point of view, most amusing rivalry between the locomotive depôts of Ipswich and Norwich. If you discussed the subject of performance on these trains with the Norwich officials and men, you gathered that "Ipswich was all very well, and did not do so badly considering——, but if you are sufficiently interested to learn how it should be done, just come along with us to Norwich and see how *we* do it." A talk with the Ipswich men was productive of some interesting particulars to the effect that Ipswich was miles ahead of Norwich in the matter of these trains—or anything else as far as that went—and somebody would instance the case of a mysterious "hot box" that Norwich had once had. Further reference in Norwich quarters led to the assurance that "hot boxes" were much more in the Ipswich line than they ever could possibly be at Norwich, where nobody had ever heard of such a thing. In one respect, however, there appeared to be cordial unanimity between Ipswich and Norwich, viz., that Stratford, at which depôt Nos. 10 and 11 were stationed, was "no class whatever."

Having by this time imbibed a considerable amount of illuminating and instructive information concerning Ipswich (at Norwich), and several varied and interesting data on the subject of Norwich (from Ipswich), to say nothing of having obtained a few fragmentary notes on Stratford (from both Norwich and Ipswich), I thought it might be as well to make a few independent observations of my own, as a result of which I came to the conclusion that both Norwich and Ipswich did uncommonly good work with these expresses, not only as regards really excellent time-keeping, but also in immunity from engine failures, which were exceedingly rare. And it reflected much credit on all concerned—both officials and men. The engines were watched after the manner of mice by cats, and the very slightest sign of anything likely to go wrong was discovered and remedied at once, so much so that I believe the "hot-box" stories were the product of the diseased imaginations of misguided rival

Digitized by Google

enthusiasts. But in August, 1900, one or two of the then new 4-4-0 engines, 1890 to 1899, were put on to these trains, and one afternoon I happened to turn into Norwich engine-shed just as the news arrived that Ipswich really had had a warm big end with one of the new engines, a piece of information which, I regret to say, was received with a certain amount of joyful enthusiasm.

The following is a run with No. 19 on the 4.55 p.m. restaurant car express from Liverpool Street, and a load of 250 tons:

M.	ch.			Booked time.	Actual time.
—		Liverpool Street ...	...dep.	4.55	4.55.0
4	3	Stratford	...pass.	5.4	5. 3.25
9	77	Chadwell Heath... ...	„	5.11	5.12.0
20	14	Shenfield	„	5.26	5.27.35
29	60	Chelmsford	„	5.37	5.37.15
38	48	Witham	„	5.48	5.47.45
51	55	Colchester	„	6 3	6. 1.55
59	36	Manningtree	„	6.12	6.10.30
68	56	Ipswich	arr.	6.23	6.21.45

The road is far from easy for a single engine with a fairly heavy load, and at Chadwell Heath No. 19 was "one down," and at Shenfield more than 1½ mins. to the bad, but not only was the whole of this time regained in the next 10 miles, but by the time the train passed Colchester the engine was "one up," and the arrival at Ipswich was 1¼ mins. to the good. The running average from the start was 47½ m.p.h., and estimated from passing Stratford to reaching Ipswich the average was 50 m.p.h.

In the autumn of 1900 the 10 to 19 class, although they had been doing excellent work, were gradually taken off the Cromer expresses, and their places taken by several of 1890 to 1899, 4-4-0 engines of the "Claud Hamilton" class. Nos. 10 to 19 were sent to work the "joint line" expresses between March and York, and remained some years on these trains until they were broken up in 1907 to 1910, after only nine to twelve years work, Nos. 12 and 13 being the last to go. I cannot help thinking that it is a great pity that these fine engines were not allowed a longer lease of life. They undoubtedly did really excellent work, and on the "joint line," over a road eminently suited to them, my own experience was that they quite held their own when compared with their coupled successors.

The train services towards the end of the century showed a gradual and steady movement. In the summer of 1900 a new seaside express, the 10.15 a.m. from Liverpool Street to Yarmouth, added another run of more than 100 miles by taking London to Beccles at a stretch, 109¼ miles in 2 h. 30 min., a speed of 43.7 m.p.h. On Saturdays only another train made the same through run.

The "Claud Hamilton" class, now the standard 4-4-0 express engines, with 7 ft. wheels, large 19 in. by 26 in. cylinders, and 180 lb. pressure, made their appearance in the closing year of the nineteenth century, and the first of the class was shown in the Paris Exhibition of that year. The engines and their work are well known, and, moreover, really belong to the present century, so that with this brief mention of them I will close my sketch of the Great Eastern as it appeared during the last 20 to 25 years of the nineteenth century.

A correspondent, Mr. A. J. Brewer, has written to me concerning a few points in my Great Eastern articles, and, amongst other things, he asks if I can state the cause of the relegation of Mr. Adams's 4-4-0 engines, Nos. 255 to 274, from passenger to goods work. I am sorry that I do not know the reasons, beyond repeating that in some way or other they did not prove satisfactory on fast passenger trains.

Mr. Brewer mentions certain alterations which were subsequently made to the 562 class, such as the rebuilding of No. 562 with link motion in place of Joy's valve gear, and the modification of 644 about 1892, when it was fitted with Morton's valve gear. I may, perhaps, state that it is impossible within the limits of these articles to mention every individual engine, and those readers who are interested in the complete records of the Great Eastern locomotives would do well to consult back numbers of the "Locomotive Magazine," in which a complete history of these interesting engines has appeared.

Referring to bogies, my correspondent mentions the similarity of the "double radial truck" of the London and North Western Railway to the Worsdell bogie adopted in 1887 on the North Eastern Railway. The latter, however, has a bogie pin, although it differs from the Adams bogie in one important particular in that the lateral displacement takes place in a curved path—i.e., radially, about a point 10 ft. behind the pin, where-

Digitized by Google

as in the Adams bogie the lateral movement is rectilinear. The London and North Western four-wheeled radial truck has no pin.

In addition to the communication from Mr. J. F. Gairns, on pages 340-1 of the November issue of the RAILWAY MAGAZINE with reference to the 0-6-0 and 2-4-2 tank engines, I have also received a letter from Lieut. C. W. Hartree, of the R.G.A., on the same subject, and since there is evidently some confusion in the minds of both writers, caused probably by the renumbering of certain engines, I may as well endeavour to straighten the matter out. The first of the modern 2-4-2 tank engines were Nos. 650 to 679, built in 1884-5 by Mr. T. W. Worsdell with 18 in. by 24 in. cylinders and Joy's valve gear. As Mr. Gairns correctly states, one of these engines, No. 674, had the link motion and 17½ in. by 24 in. cylinders originally intended for No. 696, a standard goods engine. The latter was supplied with the Joy gear and 18 in. cylinders of No. 674.

In 1886 Mr. Holden built ten more 2-4-2 tank engines of the same general type. These were originally numbered 790 to 799, and were, like No. 674, with link motion and 17½ in. by 24 in. cylinders. In 1892 No. 790 became No. 800, and still retains this number.

The 29 Worsdell engines which had Joy's valve motion were rebuilt by Mr. Holden in 1895-1897 with link motion and 17½ in. cylinders.

The above 40 engines were the only 2-4-2 tank engines *with radial axleboxes* built during the latter part of the nineteenth century. A long interval occurred, and then the design was brought out again in 1903, when Nos. 140 to 149 appeared, followed by Nos. 781 to 790 in 1904, and a very large number of others during 1905-1911, of which No. 780 was built in 1906. All these later engines were, however, built during the present century, and are beyond the scope of these articles.

In order further to clear up the confusion caused by the renumbering of certain engines, concerning which some correspondents have asked me, I should add that in 1892 20 7 ft. coupled express engines of the 710 class were built, which were numbered 700 to 709 and 781 to 790, and in 1904 the latter ten of these became Nos. 770 to 779. Some of the single engines, which had been 770 to 779, ran for about two years longer as 0770, etc., before being broken up.

Mr. Gairns refers to the 0-6-0 side tank engines with 4 ft. wheels and 16½ in. by 22 in. cylinders, of which No. 275, built in 1886, was the first. These were originally built as shunting engines, but No. 294 was tried on the Enfield local trains, and as a result Nos. 317 to 326 were fitted with the Westinghouse brake and also put to work on the same service. All these engines, however, subsequently reverted to the shunting work for which they had been designed. From 1890 to 1901 a large number of similar engines, Nos. 327 to 396, 265 to 274, 189 to 198, and 160 to 169, were built expressly for passenger work on the Enfield and Chingford services. No. 189 is now 305. These engines have cast steel wheels instead of the cast iron wheels of the shunting engines,* and the wheelbase is 6 in. longer than that of the original 275 class. They are also fitted with condensing apparatus, as mentioned by Mr. Gairns.

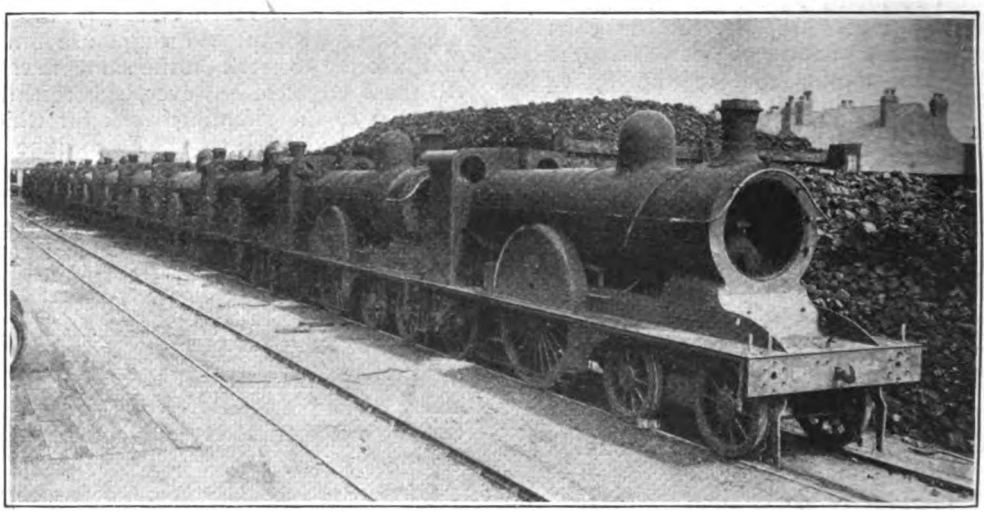
Of the smaller class of 0-6-0 passenger tank engines, Nos. 150 to 159 and 245 to 254, with 14 in. by 20 in. cylinders, four are quartered at Millwall Junction for the Blackwall service from Fenchurch Street. One of these, No. 249, remains a six-coupled tank engine, but the other three have had the coupling rods removed at the leading end, and run as 2-4-0 tank engines.

* Nos. 327 to 336 have since been placed in the shunting engine series, and the wheels are now of cast iron.

Digitized by Google

The Finish of a Famous Class of Great Northern Railway Engines.

BY the courtesy of Mr. H. N. Gresley, chief locomotive engineer of the Great Northern Railway, the RAILWAY MAGAZINE is able to reproduce three official photographs showing the complete series of single-driver express locomotives of the No. 267 class, numbering twelve engines in all, assembled in the works yard at Doncaster, and undergoing the process of dismantlement, or, as it is usually termed, scrapping. The engines were constructed in the years 1898 to 1901 at Doncaster works. They were introduced by Mr. H. A. Ivatt, and at the time represented a development of the single-wheeler and perpetuated the practice of the late Mr. Patrick Stirling, who, as is generally known, built both outside and inside cylinder engines of this class in considerable numbers for working express passenger traffic on the Great Northern Railway.

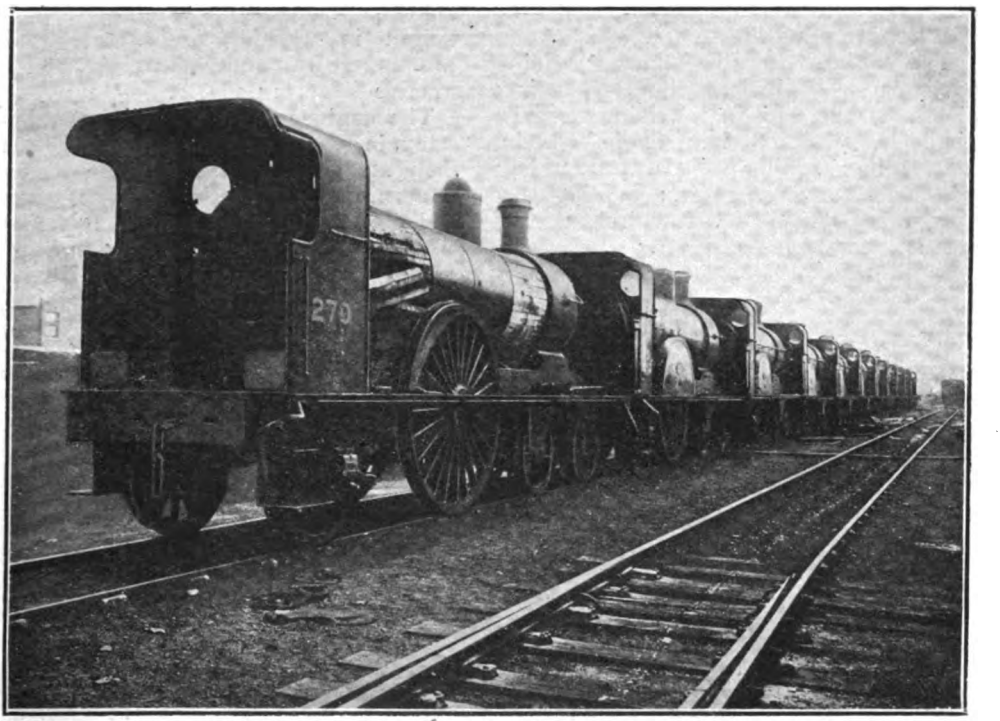


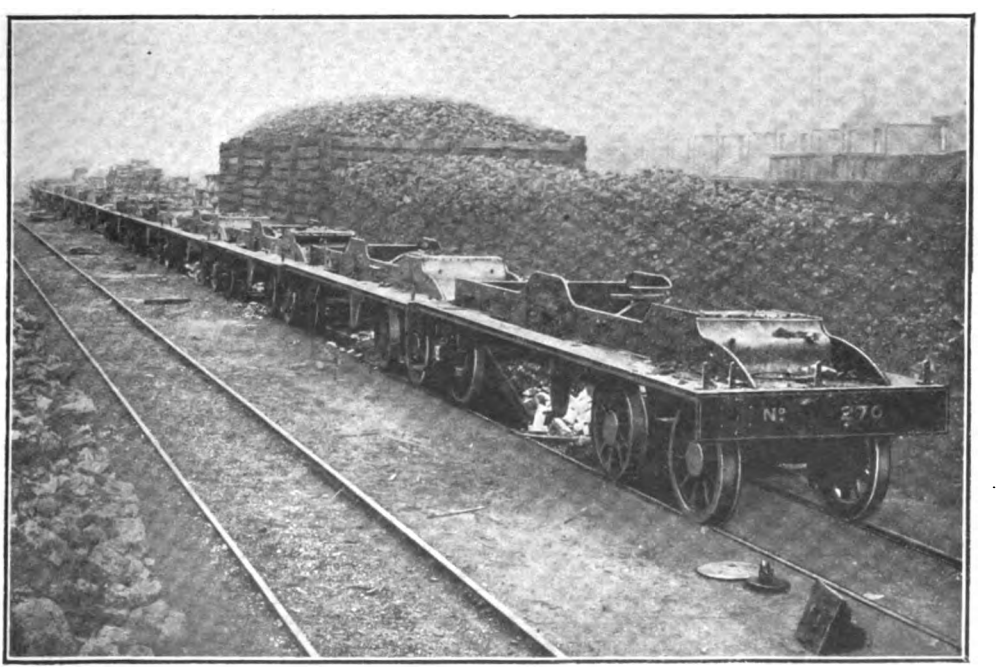
SINGLE-DRIVER EXPRESS LOCOMOTIVES UNDERGOING DISMANTLEMENT AT DONCASTER.

The express passenger traffic of the Great Northern Railway has considerably increased of late years, and the locomotives, in common with those employed on other lines, are called upon to deal with much heavier train loads than was formerly the case, the natural consequence being that the single-driver type of engine is no longer able to maintain its sphere of usefulness, and may, therefore, be regarded as having become obsolete. In these circumstances, the interests of economy are best served by taking locomotives of the type referred to out of service altogether rather than incur the expense of their maintenance when they have reached the stage at which heavy renewals are required.

The locomotives of the No. 267 class were admirably proportioned, as the list of dimensions below makes clear. They had greater adhesion weight than the famous 8 ft. singles, although the total weight was not so largely in excess of the other engines. They performed a large amount of very useful work in connection with fast passenger traffic on the main line, and showed themselves able to maintain high consecutive speeds on long-distance runs without stopping, with trains

Digitized by Google





SINGLE-DRIVER EXPRESS ENGINES SCRAPPED AT DONCASTER.

Digitized by Google

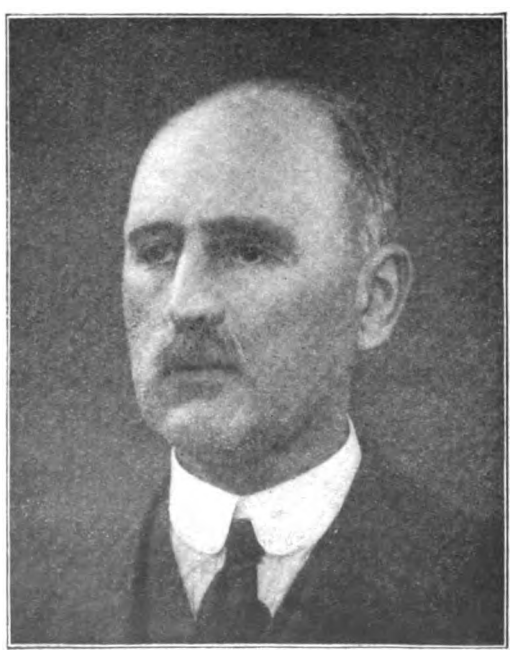
of from 150 to 200 tons weight, whilst the coal consumption was a low one.

The engines had the following leading particulars :—Cylinders, diameter, 19 in.; piston stroke, 26 in.; driving wheels, diameter, 7 ft. 8 in.; bogie wheels, 3 ft. 8 in.; trailing wheels, 4 ft. 2 in.; wheelbase, engine, 23 ft.; heating surface, tubes 1,138¼ sq. ft., firebox 124¾ sq. ft., total 1,263 sq. ft.; grate area, 21¼ sq. ft.; boiler pressure, 175 lb.; weight in working order, less tender, 48 tons 10 cwt.; adhesion weight, 18 tons; tractive force, 14,283 lb.

The engines were fitted with exhaust steam injectors, and the tender was of the then standard Great Northern Railway pattern, accommodating 5 tons of coal and 3,670 gallons of water. It weighed in working order 40 tons 18 cwt.

LONDON AND SOUTH-WESTERN RAILWAY.

Police Department.



MR. R. DUCKWORTH, M.B.E.,

Appointed Superintendent, November 1st, 1918.

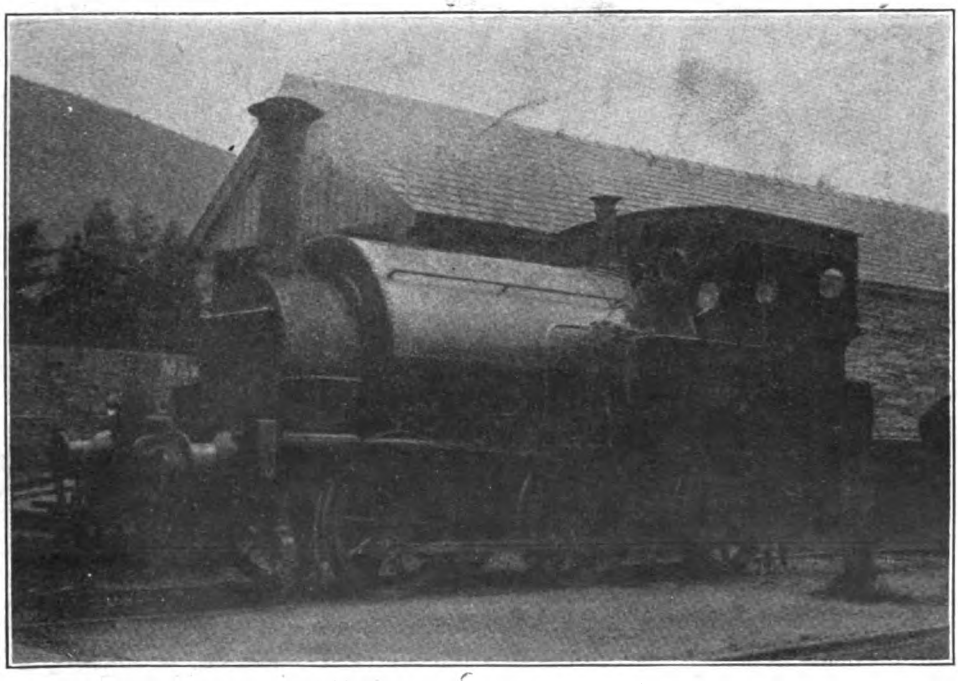
Digitized by Google

The Mawddwy Railway.

By T. R. PERKINS.

RIGHT in the heart of the lofty hills which cover so large an area of Merionethshire, and near the head of the valley through which the pretty River Dovey flows down to Cardigan Bay, nestles the tiny "city" of Dinas Mawddwy. A mere village, and a small one at that, it was a place of much importance in days of old, and actually boasted a Mayor and Corporation until 1886. Dolgelley, the nearest market town, is some 10 miles distant, the road thither climbing the hills by a pass which rejoices in the unpronounceable name of "Bwlchoerddrws" (the Pass of the Cold Door), and in every direction but that taken by the river—*i.e.*, to the south—a steep climb is necessary to reach the outer world. As might be expected, the scenery is extremely beautiful, and the district has been called by some of its admirers "The Switzerland of Wales."

In 1862 the Newtown and Machynlleth Railway was opened; this line, with its continuation to Aberystwyth, traversed the lower portion of the Dovey Valley, and passed within about 7 miles of Dinas Mawddwy. Evidently the advent of the iron horse awakened within the bosoms of the people of Dinas a desire for the benefits of railway communication, for within 6 years* the "Mawddwy Railway," a single line extending from a terminus about half a mile south of the village to a junction with the older line (by that time



Photo] [*F. E. Fox-Davies.*

SIX-COUPLED SADDLE TANK ENGINE, "DISRAELI."
Built by Manning, Wardle and Co. in 1868. No. 268 in builders' books.

* Act passed July 6th, 1866.

Digitized by Google

known as the "Cambrian Railways") at Cemmes Road, was completed and opened for traffic. It should be stated, as an additional justification for the making of the line, that several thriving slate quarries existed along its route, from which it was hoped a paying traffic would arise.

The construction of the railway afforded an instance of public-spirited generosity on the part of a local magnate—the late Sir Edmund Buckley, Bart.—who practically built the line at his own cost, and never received any return for his outlay. The original capital was £21,000, in addition to which Sir Edmund provided £20,000 for which he had no security. During the whole period of the existence of the line no dividend was paid; in fact, during the 30 years from 1871 to 1900 the working expenses exceeded the receipts by nearly £2,000. The Chairman and the directors (Sir Edmund and his two sons) never received a shilling for their services, and the property was finally sold for £4,300.

The traffic failed most lamentably to realise the anticipations of the promoters of the line; during the 30 years above mentioned only 183,000 tons were conveyed, and the total receipts were but £40,000. In spite of lavish advertising—the time-tables of the railway were to be seen as far away as Snow Hill station, Birmingham—and cheap ticket arrangements for tours in connection with the Cambrian Railways, the passenger traffic was very small,* and the state of the permanent way and rolling stock during the latter years of its existence was hardly such as to attract passengers to travel over the line. The light Vignoles rails, spiked direct to the sleepers, were so worn away that in places the upper surfaces were frayed and split, while the sleepers were in many places so unsound as to cause the road to "give" under the weight of the trains. Shortly before the closing of the line for passenger traffic several old carriages were purchased from the North London Railway; and from the fact that the driver described these to me as "grand coaches" our readers may guess what those they superseded were like!

This state of affairs could evidently not last indefinitely, and on April 17th, 1901,

Photo] [*S. H. Bailey.*

MAWDDWY RAILWAY STATION.

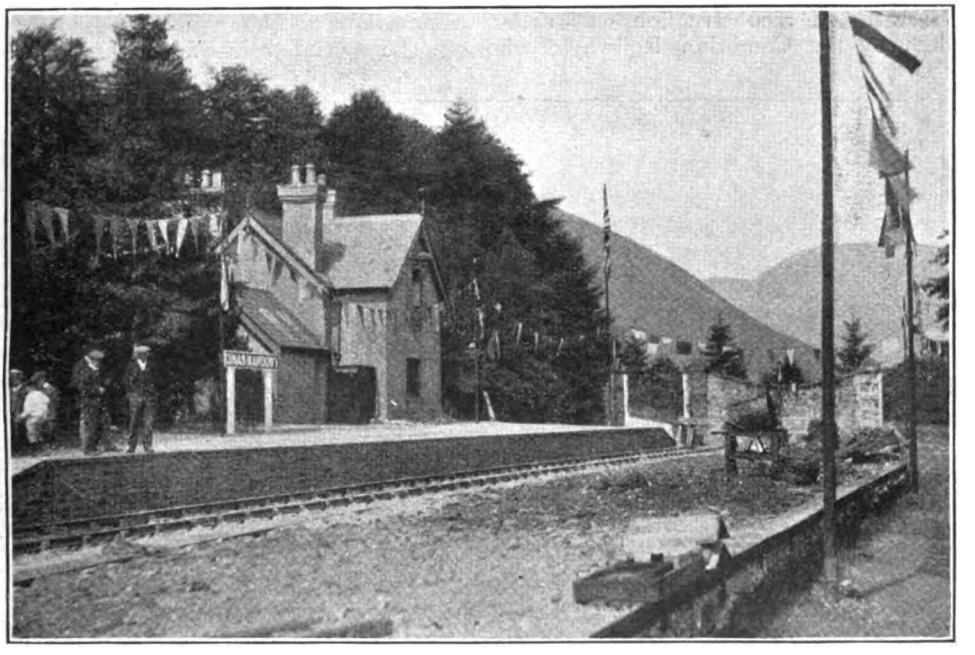
The train is about to commence its journey to Cemmes Road, hauled by locomotive *Mawddwy*.

* 842,493 passengers in the 30 years; receipts, £17,838.

Digitized by Google

the line was closed to passenger traffic; "Bradshaw" continued for some years to give a place to the railway, with the significant comment "Service discontinued during repairs," but after 1905 it was quietly dropped out both from the letterpress and the map. Until 1908 a goods train ran daily in each direction, by which the mails from Dinas were also conveyed; the running of this train was rendered possible by the local slate quarries and other interested parties paying special rates for the conveyance of their traffic. On April 8th, 1908, the line was closed entirely to all traffic, the condition of the structed, and that the cost of the necessary repairs would be about £12,000.

The total closing of the railway in 1908 had at least one redeeming feature—it revealed the benefit which the line had been to the local community. At a meeting held at Machynlleth early in 1909 in support of a reopening scheme, it was stated that the trade of the district had suffered considerably; the quarries were unable to bear the extra cost of carting their slates to Cemmes Road, and were reducing their output, with the result that many of the inhabitants of the district had been thrown out of employment; the



Photo] [*Miss H. L. Bailey.*

DINAS MAWDDWY STATION.

Photograph taken on re-opening day, July 29th, 1911.
Note the old shed shown in the former picture has been removed, and the new type of permanent way is illustrated.

permanent way being such as to render further running of trains unsafe, if not indeed absolutely dangerous.

In September, 1903, the Light Railway Commissioners held an inquiry at Machynlleth regarding an application which had been made to them for a grant towards reopening the line; nothing, however, was done, as sufficient local support was not obtained. At the inquiry it transpired that the Cambrian Railways were willing to work the line if reconstown of Machynlleth was feeling the loss of visitors from the valley to its fairs and markets; and the County Councils of Merioneth and Montgomery discovered very shortly a large difference in their outlay for the upkeep of the main road which parallels the line, owing to the heavy traffic formerly carried by rail being diverted on to it.

Once again, as had been the case more than 40 years before, a public-spirited man came to the rescue. Mr. David

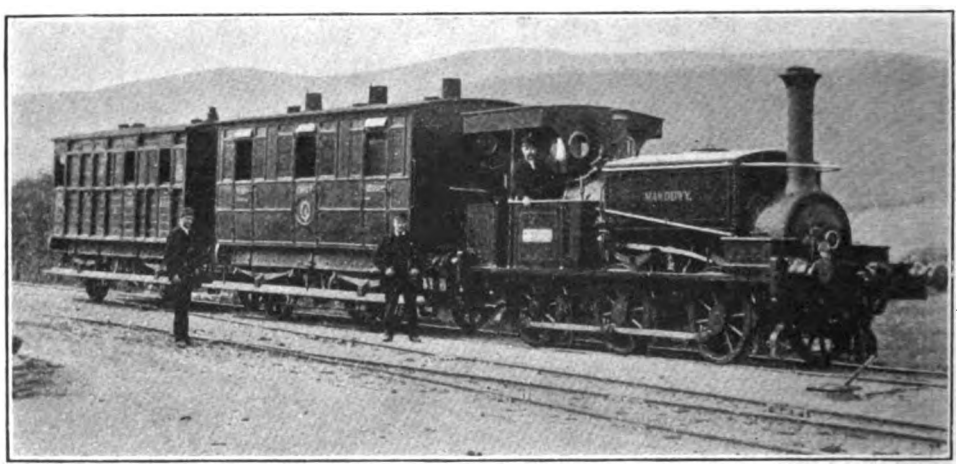
Digitized by Google

Davies, of Llandinam, M.P. for Montgomeryshire, purchased the old line from Sir Edmund Buckley for the modest sum of £4,300—it will be remembered that it had cost more than £40,000 to build!—and his action gave the necessary fillip to the scheme for reopening. An appeal to the Treasury resulted in a free grant of £9,000, and an Order under the Light Railways Act was obtained in 1910; local authorities granted loans to the extent of £5,000, and the remainder of the share capital of £20,500 was issued in debenture and ordinary shares, of which £4,500 were allotted to Mr. Davies and the remainder were all taken up locally. The work of reconstruction was undertaken by the Cambrian Railways, who also agreed to provide rolling stock and work the line when opened at a charge of 70 per cent. of the gross receipts.

Once put in hand, the work was carried forward with vigour, and all was ready for reopening towards the end of July, 1911. The cost of renewal had been estimated at £15,000, but the gratifying announcement was made on the opening day that only about £12,000 had been actually required—a fact which afforded much satisfaction to the shareholders. On Saturday, July 29, a special train conveyed a large party of residents, shareholders, and representatives of contributing public bodies from Cemmes Road to Dinas Mawddwy, where they were entertained to luncheon by Mr. Davies, who had been, most appropriately, elected chairman of the company, and who travelled upon the engine of the "special." At the luncheon representative speakers voiced the gratitude of the district to Mr. Davies for his action in carrying through the scheme to so successful an issue, and the good wishes of all for the future prosperity of the line. A pleasing function followed these proceedings, Mr. Davies being presented with an inkstand manufactured from slate quarried at three of the local quarries, and subscribed for by the farmers, quarrymen, and other inhabitants of the immediate district.

The special train was composed of six- and eight-wheeled Cambrian carriages, drawn by a rebuilt 0-6-0 goods locomotive of the same company. During the proceedings at the luncheon the school-children of the district were taken for a trip over the line to Cemmes Road and back, being afterwards entertained to tea. Public traffic on the railway commenced on the following Monday, and has been continued without intermission to the present time—except when heavy floods have prevented the running of the trains, as occasionally happens in the lower part of the valley near Cemmaes.

As an interesting comparison, the time-tables of down trains for (a) the last month before closing of the old line, (b)



Photo] [*Copyright.*

LOCOMOTIVE "MAWDDWY" WITH PASSENGER TRAIN, CONSISTING OF COACHES NO. 4 AND NO. 5.

Digitized by Google

the first month after reopening, and (c) the present war-time service are appended :—

April, 1901.

						*
	Mawddwy	...	4.50	8.40	12.15	4.30	6.40
1¼	Mallwyd	...	4.53	8.43	12.18	4.33	6.43
2¾	Aberangell	...	5.0	8.50	12.25	4.40	6.50
5½	Cemmes	...	5.10	9.0	12 35	4.50	7.0
7	Cemmes Road	...	5.20	9.10	12.45	5.0	7.10

* Wednesdays and Saturdays only.

July 31st, 1911.

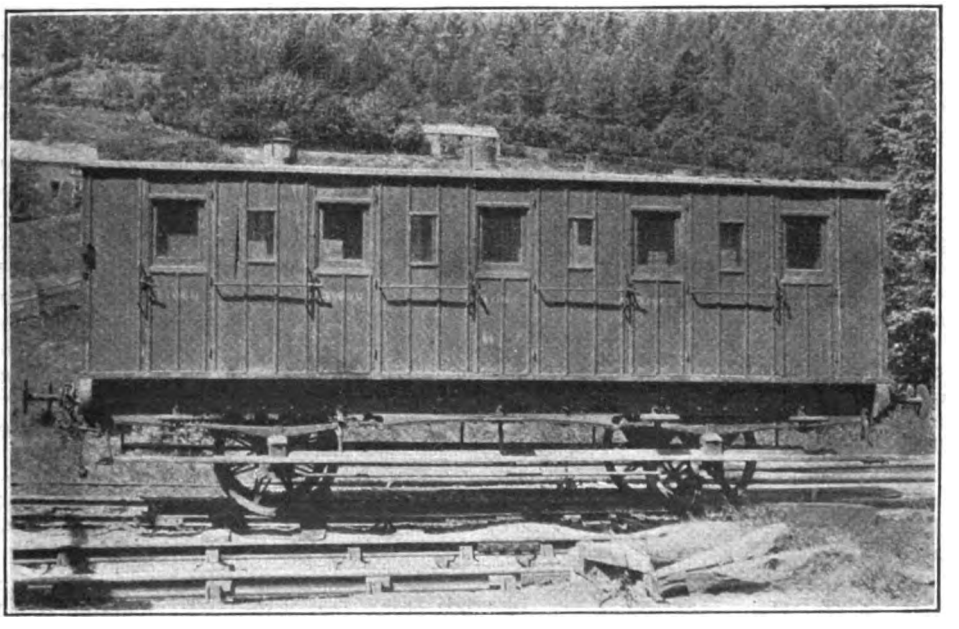
	Dinas Mawddwy	...	8.30	12.15	3.55	6.10
1¼	Mallwyd	...	8.34	12.19	3.59	6.14
2¾	Aberangell	...	8.40	12.25	4.5	6.20
5¼	Cemmaes	...	8.52	12.37	4.17	6.32
7	Cemmes Road	...	9.0	12.45	4.25	6.40

June, 1918.

	Dinas Mawddwy	...	8.25	12.35	4.5
1¼	Mallwyd	...	8.29	12,39	4.9
2¾	Aberangell	...	8.35	12.50	4.20
5¼	Cemmaes	...	8.47	1.2	4.32
7	Cemmes Road	...	8.55	1.10	4.40

In each case a corresponding number of trains ran in the opposite direction; it will be noticed that the present service is somewhat slower in the case of two down trains, but all three up trains still keep the 30 mins. timing. The distances are from "Bradshaw," but the actual distance from Cemmes Road to Dinas Mawddwy is 6¾ miles. The new owners have renamed "Cemmes" to correspond with the postal—and more correct—designation, and have also resumed the full title for the terminus, which their predecessors shortened to "Mawddwy" a few years before the closing of the line. The station was certainly known as "*Dinas* Mawddwy" as late as 1893, as I have in my possession an advertisement issued by the railway in which it is several times so designated.

My first acquaintance with the Mawddwy Railway dates back to 1900, and the memory of it is not altogether a pleasant one. Being somewhat tied for time during a visit to Aberystwyth in that year, I decided to postpone to a more convenient opportunity a contemplated trip over the line, and merely broke my journey at Cemmes Road for a sufficient time to inspect the Mawddwy Railway train, which left the station a few minutes after my arrival. The ramshackle appearance of the old locomotive *Disraeli* and its antiquated train of two coaches kindled within me—as one whose special study is the quaint and unusual in the railway world—a keen regret that I had neglected to explore the line, coupled with a resolve to do so at the first possible opportunity; but, alas! before next year's holiday came round



Photo] [*Miss H. L. Bailey.*

OLD THIRD-CLASS PASSENGER CARRIAGE, NO. 2.

Digitized by Google

the ominous notice in "Bradshaw" sounded the knell of my hopes, and the chance of travelling in what must have been the most uncomfortable train in the country was gone for ever.

In the summer of 1904, being once more on holiday in Wales, I approached Mr. C. E. Williams, who was secretary and general manager of the line, with a view to obtaining permission to travel over it on foot and inspect the rolling stock, etc. With much-appreciated courtesy, Mr. Williams not only granted me all the facilities asked for, but also offered the privilege of travelling in one direction on the engine of the daily goods train, an offer which was, of course, gratefully accepted. Accompanied by Mr. Fox-Davies with his camera, the walk to Dinas over the grass-grown track proved most fascinating, and a number of photographs were secured with a view to their use in this article—which latter we little dreamed would be so long ere it saw the light. The state of the permanent way reminded us forcibly of the "Potteries" Railway—then also derelict, and over which we had recently tramped—except that the Mawddwy Railway was, if anything, in a worse state of repair. Hedges, long neglected, had grown to a great height, the track was in places an actual swamp owing to collapse of the drainage arrangements, and the rails were for the most part hidden under a fine crop of grass. Signals were, of course, non-existent, but a few half-obliterated gradient posts were met with at various points on the line. On arrival at Dinas we found that *Disraeli* was to be our steed on this occasion, the smaller locomotive *Mawddwy* not being in steam that day; we were, however, able to inspect it in the shed. The remainder of the passenger rolling stock, consisting of six vehicles, was also standing at Dinas Mawddwy, and a description of it may not be out of place at this point.

The two locomotives just mentioned were the only ones ever possessed by the railway, and were both built by Manning, Wardle and Co., of Leeds, *Mawddwy* in 1864 and *Disraeli* in 1868. Both were saddletanks of the 0-6-0 type, *Mawddwy* having wheels of 3 ft. 1½ in. diameter, and cylinders 12 in. by 17 in.; *Disraeli* was somewhat larger, its cylinders being 13 by 18, and its wheels 3 ft. 6 in. diameter. In 1893 *Mawddwy* was rebuilt, and was fitted with the vacuum brake; *Disraeli*, however, ended its days in its original condition. On the Cambrian assuming control in 1911, *Disraeli* was promptly scrapped, but *Mawddwy* was again rebuilt and put to work; it has now, I believe, shared the fate of its sister engine. At the time of my visit in 1904 *Disraeli* was painted green; *Mawddwy*, on the other hand, sported the then Cambrian colours—black, with orange lines. Both engines had fluted copper safety valves. From the illustration of *Disraeli* on page 373 it will be noticed that the smokebox door was of antiquated pattern, opening from the bottom upwards.

As previously mentioned, two of the passenger carriages had been obtained from the North London Railway shortly before the closing of the line to passenger traffic; these were of that company's standard four-wheeled pattern, open from end to end, and without upholstery. They retained their former livery of varnished teak, also—most curiously—their N.L.R. *numbers*, although I believe I am correct in stating that the words "Mawddwy Railway" had been substituted for the name of their previous owners: I recollect most vividly our amusement at our introduction to carriage No. 1140 of the Mawddwy Railway, and our speculations as to the impression it would produce upon outsiders should it ever stray on to "foreign" territory. One or both of these coaches bore the words "William Jones, Owner," painted upon the frame in a not too conspicuous position; evidently the necessary cash had had to be advanced for their purchase.

But it was the remainder of the coaching stock that was most calculated to appeal to the railway archæologist; the carriage siding at Dinas was indeed a worthy nucleus for a railway museum. Three carriages remained in running condition, the fourth—and most interesting—had been removed from its wheels, and was in use as a tool shed behind the station buildings. This venerable relic commenced its career on the London and North Western Railway about the year 1852, and after considerable service on that system ended its days on the "Mawddwy." It ran on four wheels, and boasted three compartments—a "first" and two "seconds." A photo-

Digitized by Google

graph, to be reproduced next month, brings out most clearly the curious features of this quaint old vehicle, and illustrates very forcibly the advance that has been made during the past 66 years towards the provision of comfort in travel. It will be noticed that one of the "seconds" has very small quarter-lights, while in the other they are entirely absent. The paint had almost disappeared at the time when the photograph was taken, but sufficient remained to show that the L. & N.W. livery had probably been retained to the last; the words "first class" and "second class" were also painted on in full, instead of the more modern "first" and "second."

It may be mentioned that an illustration of this carriage, as it appeared before being dismantled, appeared in the "Wide World Magazine" for October, 1907, page 29.

The three carriages just described were numbered respectively 3, 6, and 1; No. 4—next the engine in the photograph of the train—was perhaps the most modern in appearance of any of the original coaches, and was fitted with the vacuum brake. Like the others, it was a four-wheeler, and had three compartments, labelled respectively "second," "first," and "third smoking." The last of these was, of course, cushionless, while the upholstery of the "second" was decidedly scanty; the "first" boasted the familiar blue cloth, but was very shabby and out of repair. The other carriage on the train—No. 5—was a brake third, and much resembled some of the old stock formerly running on the Highland Railway; this vehicle was almost derelict before the closing of the line, and practically fell to pieces in the years that elapsed before the reconstruction, as can be seen from the photograph on page 376, which was taken in 1911. A carriage of almost identical design may still be seen near Caersws, on the Cambrian main line; this formerly ran on the once independent Van Railway—now a Cambrian mineral branch—and stands derelict alongside that line, little but the skeleton now remaining.

Only No. 2 remains to be mentioned; this, like all the rest, was a four-wheeler, and was in some respects the quaintest of all. It was a five-compartment "third," and bore a somewhat remarkable resemblance to some of the carriages of the same class still to be seen on the French railways, with its straight sides, unusual style of panelling, and almost entire absence of windows. Except for the glazed apertures in the upper part of the doors, only four tiny windows were provided on each side of the carriage, which was, of course, open from end to end. The seats were exceedingly narrow wooden benches, the only back-supports consisting of a wooden bar running across the carriage about 18 in. above the seats. The roof was too low for a man of average height to stand upright, and the distance between the seats equalled for narrowness the benches themselves. Three oil-lamps provided some kind of illumination after nightfall. It will be noticed that the doors were hinged on the opposite side to that usually adopted.

These three coaches had all been at one time painted a shade of red, which towards the end of their career had almost disappeared; no upper footboards were provided, an iron step being affixed below the door of each compartment. Fortunately, all the platforms on the line were fairly high, so that no great inconvenience resulted from this arrangement, which was the usual one in the early days of railways.

(To be continued.)

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

Digitized by Google

British Locomotive Practice and Performance.

By CECIL J. ALLEN

Photo [*J. Macartney Robbins.*

SOUTH EASTERN AND CHATHAM RAILWAY.

4-4-0 locomotive, No. 726, on Ashford-Victoria train, near Charing.

A CHANCE question at a recent lunch-table conversation, although easily answered, opened up what was to me so interesting a train of thought as to suggest a ventilation of the subject concerned in these columns. I cannot remember the exact wording of the query, but the purport of it was as follows:—"Why is it not possible to frame a time-table which shall always be capable of punctual observance?" It is hardly necessary to add that my questioner was not a close observer of ordinary railway working, as the answer to anyone having but a moderate acquaintance with railway conditions must surely be obvious. In brief, it is that no time-table could ever be designed to cover all abnormal circumstances which are likely to arise in the course of any journey. Or, if such a table were devised, the journeys scheduled by it would be of such unconscionable sloth as to revolutionise all our current notions of travel. But let us examine the causes which contribute, severally and collectively, to divergence from schedules.

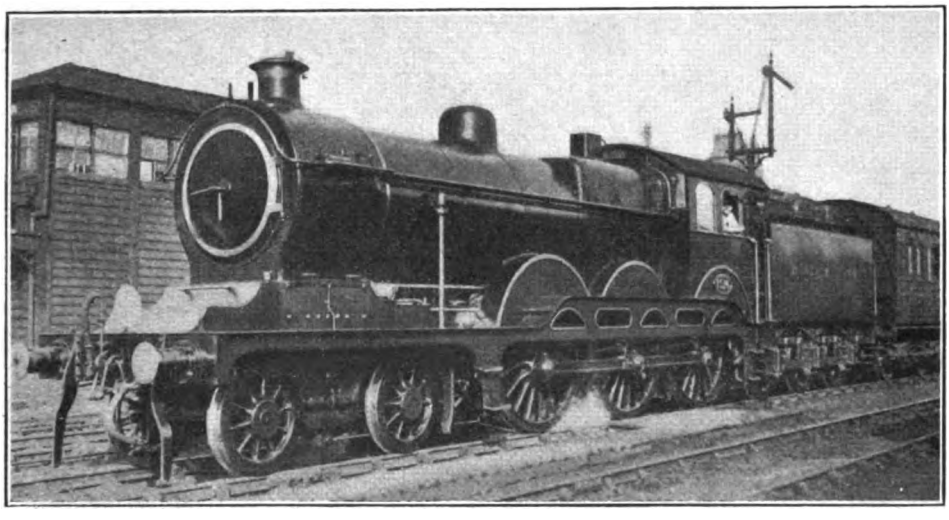
So far as the compilation of train journals is concerned, all sources of delay are divided roughly into three groups — locomotive, engineering, and traffic delays—and the appropriation of lost time under these heads, as may readily be imagined, not infrequently leads to slight differences of opinion between the functionaries mainly responsible, *i.e.*, drivers and guards. Let us first, then, consider the classes of delay generally booked "against engine," which are capable of various subdivisions. Weather is a serious factor in train running. Side-winds pressing against the length of a train force the wheel flanges on the "leeward" side against the rails, and if really severe, may occasion a serious leakage of tractive power in overcoming additional flange friction. Drizzling rain, on the other hand, makes the rails greasy, and is liable to reduce the coefficient of friction between driving wheels and rails to such an extent that a good deal of slipping of the former takes place, with consequent loss of power. Worst of all, the effects of fog and heavily falling snow are too well known to require comment. These are external conditions. Now, as regards the locomotive itself, a mechanical defect may be developed; a bearing may "run hot," or tubes may commence to leak, or

Digitized by Google

something else still more serious may happen, necessitating either cautious running, or definitely impairing the capacity of the engine, or, in the worst event, making it imperative to stop the train and exchange the defective engine for any other that may be available. In addition to the thousand and one possibilities of defects, there is always the indisputable fact that no two engines of a class behave exactly alike, and some locomotives simply refuse to work altogether satisfactorily, no matter to what extent they are humoured. Such contingencies it is impossible to guard against or adequately to allow for.

A third set of conditions—in this case really traffic conditions—relate to the loads, variation in which, of course, directly affects the working of an engine. A driver can hardly be expected to make the same times when the weight of his train, for some special reason, has been augmented to such a degree as to become abnormal, although many are the gallant efforts made by drivers to cope with conditions such as these. Or, again, it may so happen, for unavoidable reasons, that an engine of inferior power has been provided to work an important train, in which case also the driver cannot be blamed if he fails to keep time. Lastly, there is the possibility of inefficient driving or firing to take into account, with consequent slack running and loss of time, while, on the contrary, it must not be forgotten that the sporting efforts which so delight the heart of the compiler of logs are also subversive of the time-table idealism sought after by my friend who put the question, when the driver is running ahead of time. The main point, however, is that it is impossible to arrange margins of time in the time-tables which shall compensate for all these possible sources of delay, happening as they may do only occasionally, and probably each time on a different stretch of line.

Next, we have engineering delays, *i.e.*, loss of time occasioned by slow running over permanent way repairs or other work in course of being carried out by the civil engineer. As is well known, the gradual abrasive wear of the head of the rails, and the wear and tear of track generally, render necessary at intervals, varying according to the amount of traffic over the section in question, the renewal of the rails, or of the track as a whole, the latter operation being known as "relaying." Now, obviously it is imperative that the speed of trains shall be reduced during the progress of this work, which may take some weeks to complete. Some of our larger companies adopt the more



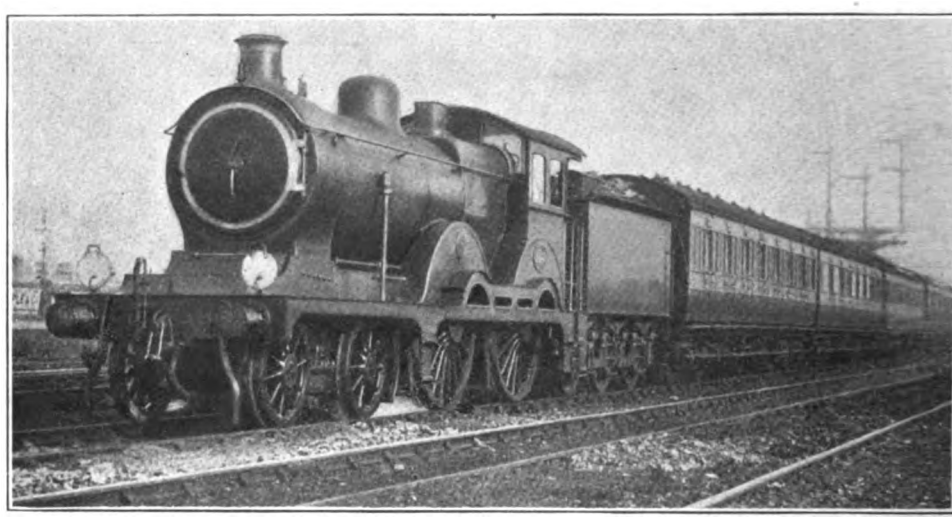
Photo] [*W. H. C. Kelland.*

GREAT EASTERN RAILWAY.

4-6-0 superheater locomotive, No. 1516, at Cambridge.

Digitized by Google

expensive expedient of carrying the whole of the operations through on Sundays, and the times of their Sunday expresses are increased correspondingly in order to allow a certain margin of delay from this cause. Generally speaking, however, only the actual replacement of the track takes place on Sundays, packing up the road and finishing off occupying several subsequent weeks, during the whole of which a "p.w.r." slack, generally to 15 m.p.h., is in force. Again, the renewal of underline structures here and there is called for at intervals by reason of age or defects, and such renewals can only be carried out under running traffic if a slack



Photo] [*J. Macartney Robbins.*

GREAT EASTERN RAILWAY.

"Claud Hamilton" type 4-4-0 engine, No. 1840, on up Lowestoft luncheon car express at Cambridge.

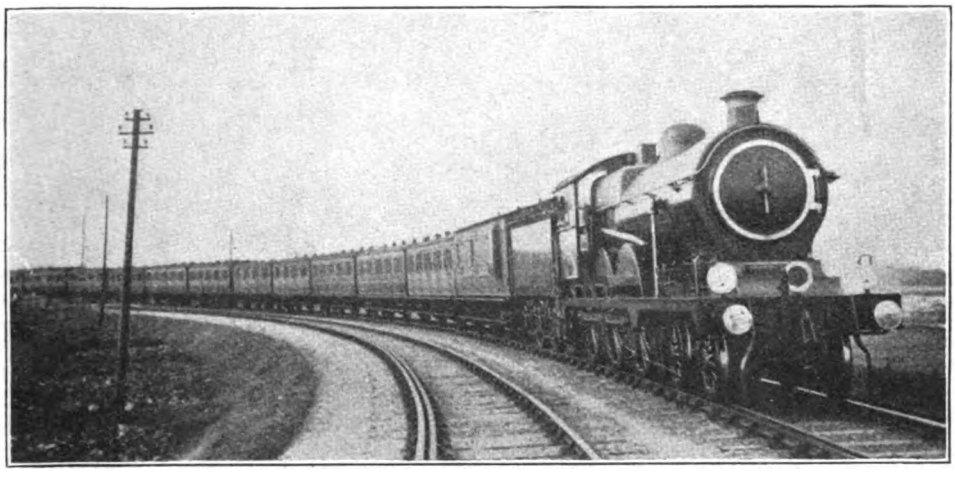
to, say, 10 m.p.h. be imposed. Then such casualties as slips in cuttings or embankments have to be covered by rigorous cautions, imposed often for weeks at a time. Here, again, therefore, are some material causes contributory to loss of time, which no time-table could be designed to cover, owing to their variety in locality and duration and the comparative uncertainty of their incidence.

Finally, we come to traffic delays pure and simple. There are the familiar delays at stations due to abnormal crowds of passengers or piles of luggage, delays in attaching and detaching vehicles, delays by waiting connections, as well as of other sorts and kinds too numerous to mention. In goods working, shunting or marshalling at a particular station or stations may take a great deal over the normally allotted time, and delay results. The running of special trains—particularly of special goods trains—is unavoidable, and these have to be fitted in to what may already be a congested time-table, with almost certain delay somewhere. Most fruitful of all in the aggregate loss of time they cause to all classes of trains are signal checks, which are generally regarded as traffic delays. But what is the origin of signal checks? They, in their turn, are the fruit of all the delays previously enumerated. A carefully compiled time-table over a well-used route is like a delicate piece of mechanism, of which the displacement of one cog will affect the working of the whole machine. So the seriously late running of any one important train may affect others by signal checks or delayed connections in ever-widening circles of distance until its baneful effect has possibly spread over a considerable portion of the railway system concerned.

Probably the most ideal of all time-table conditions are found on tube railways. To these profound depths weather does not penetrate; the likelihood of the development of mechanical defects *en route* is reduced to a minimum by the

Digitized by Google

shortness of the journeys; increase of load automatically entails increase of tractive effort; efficiency and inefficiency of driving have no effect on the production of the motive power; civil engineering slacks do not exist, as all track work is carried out at night, when the current is shut off; the volume of passengers at any given hour is approximately constant; no luggage has to be dealt with; and there are no special or goods trains to upset the working. But it is possible for train services so free as are these from all conditions likely to cause delays to suffer dislocation at times from electric or other failures: it was, indeed, to some such reason as this that I owe the unique experience on one occasion of being taken non-stop through suburban and local ones, with their uniform loading and working conditions. Conversely, the larger the main line and the more ramified its connections, the greater the liability to disturbance to its time-table from one or more of the causes previously outlined. Some companies, notably the Midland, have hitherto allowed certain of their important trains from 3 to 5 min. in excess of the normal times, over certain stages of their journeys, for "time lost by exceptional circumstances," *i.e.*, as a recovery margin. The objection to the arrangement is that, assuming such delays occur on, say, as many as 20 per cent. of the days on which the train runs, on the remaining 80 per cent. the train has to fill out this extra



Photo] [*W. H. C. Kelland.*

GREAT EASTERN RAILWAY.

Up Newmarket Race Special rounding Coldham Lane curve near Cambridge.
4-6-0 superheater engine, No. 1512.

the Bank Station, in order that a delayed Central London westbound train might have a better chance of recovering its schedule. In cases where electric lines come to the surface, and especially lines collecting current from conductor rails, the weather factor has very decidedly to be considered in winter-time, owing to the liability of ice forming on the conductors, and preventing the picking up of the current. Such a contingency as this, of course, could not possibly be allowed for in time-tables, as it might only happen on one or two days in the year.

Of steam-hauled services those least liable to abnormal conditions are naturally time on the road or else to run before time. Failing such an arrangement as this, should drivers be encouraged to regain lost time? I argued this question, together with the general question of abnormal running conditions, at considerable length in the March and succeeding issues of 1915, and do not propose to go over the ground again at present. Prior to the war one certainly recorded a regaining of lost time far more frequently than a slavish adherence to booked point-to-point times, subsequent to delays, and I think it cannot be gainsaid that the most satisfactory time-table, from the point of view both of the public and of the railway

Digitized by Google

company, is one possessing a reasonable measure of elasticity, *i.e.*, a small margin incorporated in each schedule throughout (though not specified over one short section of the journey only, as in Midland practice) to allow of the recovery of minor delays. This recovery the driver should be encouraged to make, in order that schedule times may be regained at the earliest possible moment. But clearly no time-table could ever be framed to cover all the abnormal conditions of running which so frequently arise.

It is now some considerable time since last I gave any details of locomotive work on the Great Eastern Railway, and I am reminded by the letters of a naval correspondent, who has from time to time furnished me with a large number of carefully compiled records over that line, especially between London and Cambridge, that the actual merit of present G.E.R. performance is by no means inferior to that of pre-war days. Indeed, a close examination of the current Great Eastern time-tables reveals the fact that, although overall times have been greatly increased by the insertion of extra stops, point-to-point schedules remain much as previously, so that, taking into account the tremendous loads of the principal trains, and the frequent starting and stopping, very hard work is called for, especially in view of the fact that the exits from all the principal stations are on up grades in both directions. Before dealing with my friend's experiences, however, I should like to detail one or two of my own on the still smartly timed Southend service.

In the down direction I have had two runs on the 4.48 p.m. express, which still retains its difficult time of 63 min., inclusive of four stops, from two of which the start is rising at 1 in 100. In addition, this train carries a full load through to Southend, instead of dividing at Shenfield or Wickford. On my first run, with "Claud Hamilton" class 4-4-0, No. 1861, and 30 axles, or 195 tons, we kept our end-to-end time, but only in virtue of a late start, which enabled to us leave certain intermediate stations at what would otherwise have been before time. We were through Stratford, 4 miles, in 7¾ min., slacking carefully as usual; Chadwell Heath, 10 miles, in 15 min. 20 sec.; Harold Wood, 15 miles, in 21½ min.; Brentwood, 18.2 miles, in 25 min.

Photo] [*K. A. C. R. Nunn.*

GREAT EASTERN RAILWAY.

Whitemoor-Spitalfields express goods train approaching Park.
"Claud Hamilton" class 4-4-0 locomotive, No. 1892.

Digitized by Google

50 sec.; and Ingrave 19.3 miles, in 27 min. 50 sec.—on the 1 in 84 our speed fell to 32 m.p.h.—and reached Shenfield, 20.2 miles, in 29 min. 20 sec. Schedule is 30 min. The falling start from Shenfield enabled us to touch 57½ m.p.h. at Mountnessing, and pass Billericay—at 42½ m.p.h.—4.2 miles, in 6 min.; attaining 74 m.p.h. on Ramsden bank we stopped at Wickford, 8.8 miles, in 10 min. 55 sec., or practically as booked. On the short 1 in 100 rise from Wickford we worked up to 24½ m.p.h., and then attaining 47 m.p.h. on the brief subsequent descent, completed the 4.1 miles to Rayleigh, passing Hockley, 3 miles, in 5 min. 55 sec. But our total time from Liverpool Street to Southend, 41.5 miles, was 63 min. 25 sec., a little time having been gained at the stops as well as in the running to offset the loss just referred to.

The second journey was unfortunate, as we were badly delayed, especially at the finish, where we ran into the signals of the Southend portion of the 4.18 p.m. down. A heavier load of 34 axles is now always carried, also, weighing 225 tons full; the engine was No. 1827 of the "Claud Hamilton" class. Our first check was one to 15 m.p.h. at Stratford

Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Reading-Redhill goods train, near Betchworth.
0-6-0 rebuilt locomotive, No. 234.

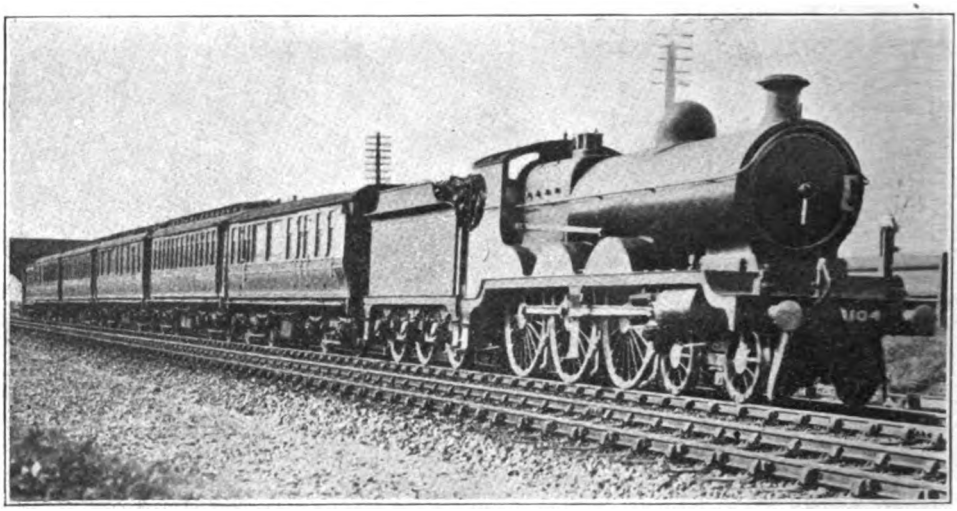
mainly rising at 1 in 100, in 7 min. 25 sec. Restarting from Rayleigh in exactly 8 min. from Wickford, as booked, the driver was quite unable to maintain the 9 min. allowance on to Prittlewell; this time for 7.8 miles, which include more than ½ mile ascent at 1 in 100 from the start, and a further subsequent ½ mile up at the same inclination, before Hockley bank is reached, is possibly feasible with a very light load, but certainly a "counsel of perfection" with a 30-axle train. In point of fact, we took 10 min. 35 sec., Western Junction, so that we took 8¾ min. to Stratford, and 16 min. 55 sec. to Chadwell Heath; Harold Wood was passed in 23 min. 5 sec., or 21¾ min. net. Then we were badly checked right through Brentwood, and so took 34 min. 55 sec. to Shenfield. After Shenfield we touched 59 m.p.h. at Mountnessing, and only fell to 46½ at Billericay, but speed on Ramsden bank did not exceed 69 m.p.h.; so we passed Billericay in 5 min. 55 sec., and reached Wickford in 11 min. 5 sec. Wickford to Rayleigh took 7 min. 35 sec.,

Digitized by Google

and from Rayleigh we did fairly well to pass Hockley in 5¾ min., but thereafter we were seriously delayed, and reached Southend 9¾ min. late.

Shortly before the 12.10 p.m. down train was altered to call at all stations on the branch, and while it still retained the "crack" G.E. timing of 21 min. from Shenfield to Rochford (an average of 53 m.p.h.), I made a journey by it which was badly delayed as far as Brentwood. Thence No. 1795, with 26 axles (155 tons), did very well to run to Shenfield with a rising start of a mile beginning at 1 in 84, in 4 min. 20 sec. (2 miles). From Shenfield we passed Billericay in 5 min 35 sec. at 48 m.p.h., having touched 61½ at Mountnessing, but only attained 69 m.p.h.

In the up direction the 8.15 a.m. *ex*-Southend, still running in its 60-min. schedule, provided a couple of interesting trips. On the first occasion No. 1791, the 4-4-0 fitted with Weir feed-water heating apparatus, was the engine, and on the second No. 1853 Loads were 35 axles and the now standard 39 axles respectively, weighing full about 235 tons and 265 tons, from Southend, and some 245 and 275 tons from Brentwood, where a heavy complement of passengers joins the train. From Prittlewell, after stops of 20 sec. and 45 sec., No. 1791 got away in 2½ min., and No. 1853 in 3 min. exactly. The falling mile at 1 in 150 from Prittlewell produced maxima of 47½ and 45½ m.p.h., and on the 2½ miles at 1 in 100



Photo] [*F. E. Mackay.*

GREAT CENTRAL RAILWAY.

Up Bradford and Sheffield express.
4-6-0 locomotive, No. 1104.

on Ramsden bank, and then for some obscure reason slacked vigorously, so taking 10¼ min. to pass Wickford. After that the work was poor, as we fell to 33 m.p.h. on Rayleigh bank, and only touched 67 beyond Hockley, so taking 15 min. to Rayleigh (12.9 miles), 19¼ min. to Hockley (16 miles), and 22 min. to Rochford stop (18.5 miles). In the end we succeeded in maintaining the schedule of 36 min. from Brentwood to Southend, inclusive of nearly a minute over time at Shenfield, but, seeing that we were 5 min. late, one might have expected some rather more brisk running.

of Hockley bank we fell to 31 and 28½ m.p.h., so that we passed the latter station, 4.8 miles, in 7 min. 40 sec. and 8 min. 20 sec., and Rayleigh, 7.8 miles, in 12 min. 10 sec. and 13 min. 10 sec. Touching 69 and 70 m.p.h. on Rayleigh bank, we were through Wickford, 11.9 miles, in 16 min. 5 sec. and 17 min. 10 sec. Up Ramsden bank No. 1853 did decidedly the better work, despite the heavier load, only falling to 33½ m.p.h. on nearly 4 miles at 1 in 100; No. 1791's minimum was 32 m.p.h. So Billericay, 16.5 miles, was passed in 22 min. 20 sec. and 23 min. 20 sec., and Shenfield, 20.7 miles, after

Digitized by Google

maxima of 62½ m.p.h. in each case at Mountnessing, in 27¼ min. and 28 min. 25 sec. No. 1791 made a severe, but the less pronounced, slack over the junction, and so reached Brentwood, 22.7 miles, in 30 min., whereas No. 1853 took 32½ min.

Restarting on the falling grade, the former engine passed Harold Wood, 3.2 miles, in 4 min. 55 sec., at 61 m.p.h., but was then slightly checked by signal at Romford Factory; nevertheless Chadwell Heath, 8.2 miles, was passed in 11 min.; Stratford (after a second slack at Forest Gate Junction), 14.2 miles, in 18 min.; and Liverpool Street was reached, with the usual cautious running past Bethnal Green, in 25 min. 10 sec. from Brentwood, or about 24 min. net for the 18.2 miles. Total time from Southend was 59¾ min., or 58½ min. net. No. 1853 left Brentwood 2¾ min. late, and shortly afterwards was badly slacked for p.w.r. operations; consequently the speed at Harold Wood was only 53 m.p.h., but by dint of really fine work the driver accelerated on the very slightly falling grades beyond to 65 m.p.h. at Seven Kings, so passing Harold Wood in 5½ min., Chadwell Heath in 10 min. 35 sec., and Ilford, 10.9 miles, in 13 min. 5 sec., or 12 min. net. Apart from delays, we should nearly have achieved "even time" at Stratford, and should certainly have arrived on time; as it was, we suffered six moderate checks, but still reached Liverpool Street in 25½ min. from Brentwood, ½ min. under time, or 22½ min. net. In this case the total time from Southend was 62 min. 10 sec., or 59 min. net.

Of the runs recorded by my friend, there are first one each on the heavily laden 10 a.m. and 3.10 p.m. expresses from Liverpool Street to Ipswich. The former loaded to 14 corridor 8-wheelers, including restaurant cars, and two 6-wheelers, 62 axles, 397 tons empty, and not less than 435 tons with a very full load of passengers; it was hauled by superheater 4-6-0 No. 1504. Ilford, 7.3 miles, was reached in 13¼ min. From there Chadwell Heath, 2.7 miles, was passed in 5 min. 25 sec., and Harold Wood, 7.7 miles, in 12 min. 5 sec., but the ascent of Brentwood bank was poor, speed falling to 18½ m.p.h., and the time of 23 min. 25 sec. to Shenfield, 12.9 miles, was further increased by a permanent way check through that station. Maximum speed beyond Ingatestone was 63½ m.p.h., and Chelmsford, 22.4 miles, was reached in 34 min. 25 sec., or 33½ min. net. Schedule is 31 min. On the 3.10 p.m. No. 1509 did much better work with a 63-axle train, although the large proportion of 6-wheeled non-corridor stock in this case made the tare load 349 tons, and the gross load (the train was crammed) 390 tons. Stratford was passed in 8 min.

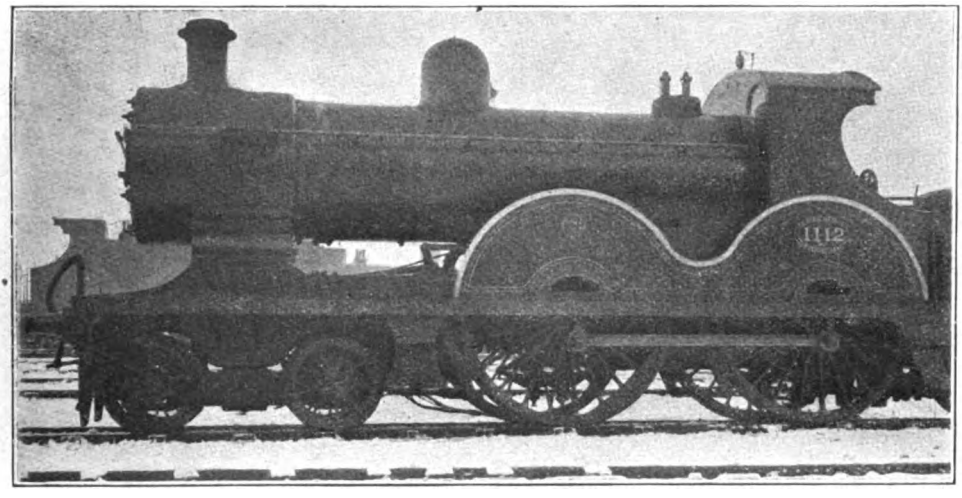


Photo [*W. H. Whitworth.*

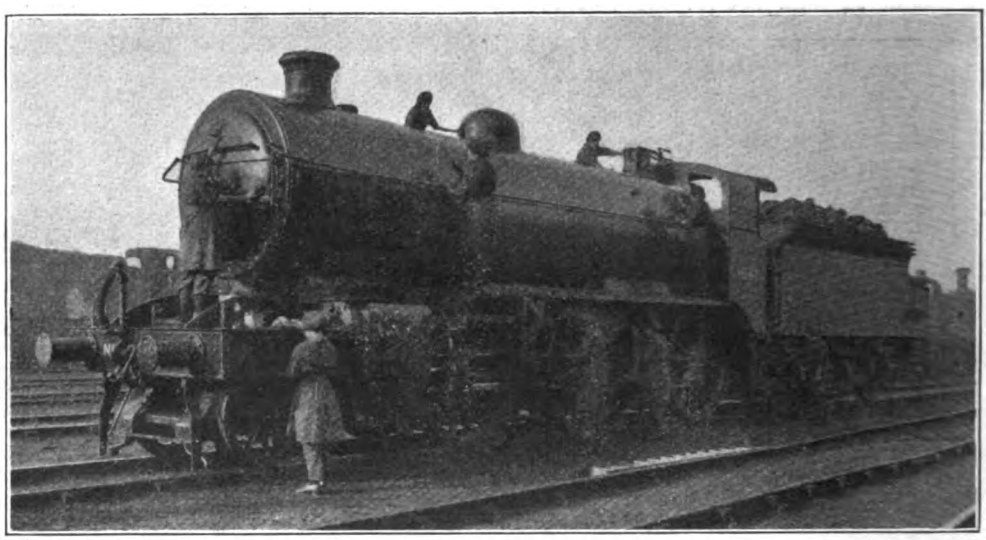
LANCASHIRE AND YORKSHIRE RAILWAY.

Rebuilt 4-4-0 locomotive, No. 1112, formerly a 4-cylinder compound.

Digitized by Google

10 sec., Chadwell Heath in 16¼ min., Brentwood in 26 min. 55 sec., Shenfield in 30 min. 35 sec., and Chelmsford, 29.7 miles, was reached in 40 min. 10 sec., 50 sec. early. The lowest rate on Brentwood bank was 26 m.p.h., but beyond Ingatestone speed rose to 70½ m.p.h. Good work was done on both journeys beyond Chelmsford, and especially the first. Despite the rising start, No. 1504 passed Hatfield Peverel, 6.2 miles, in 8¾ min.; Witham, 8.9 miles, in 11 min. 35 sec. (at 61½ m.p.h.), and reached Mark's Tey, 16.9 miles, in the smart time of 20 min. 20 sec., 1¾ min. inside schedule. From Mark's Tey to Colchester, again, a very smart run was made in 7 min. 50 sec., start-to-stop, the distance being 5.1 miles, and the booking 9 min. The 3.10 p.m. does not call at Mark's Tey, and No. 1509 passed Hatfield in 9¼ min., Witham in 12¼ min., Mark's Tey in 21 min. 5 sec., and reached Colchester, 22 miles, in 27 min. exactly, in this case 3 min. inside schedule time. The many subsequent stops on both trains render the continuation of the running uninteresting, but the foregoing details show the really excellent work of the 6-coupled engines under such onerous conditions of loading.

My correspondent's Cambridge line runs are so numerous that I must content myself with taking several of them more or less at random, and with describing them as briefly as possible. On the noon express *ex*-Liverpool Street, before its alteration to 11.50 a.m., and the concurrent insertion of stops between Bishop's Stortford and Cambridge, No. 1524, 4-6-0, had a load of 53 axles, or 360 tons. Signal checks were experienced at London Fields and Clapton, in addition to the customary hindrances over this length, so that it took 14 min. 20 sec. to pass Tottenham, 6 miles. From there the 11.1 level miles on to Broxbourne were covered in the usual leisurely fashion in 13¼ min., and the 9.6 miles on to Sawbridgeworth, gradually rising, somewhat briskly in 11 min. 10 sec.; Bishop's Stortford, 30.4 miles, was reached in 43¼ min., or 40½ min. net. From there a fine start was made up to Elsenham—these G.E.R. 4-6-0's excel in their starting efforts—the 5.2 miles, with their final 1¼ miles' ascent at 1 in 132-107, on which speed fell to 41 m.p.h., taking 8½ min. only. Thence the 6.1 miles to Audley End occupied 6¾ min., with a maximum of 60 m.p.h. at Newport, and a minimum of 55 at the tunnels, while the next 9 miles to Sawston, where the train was pulled up by signal, took 10¼ min.—20.3 miles in 25½ min., start-to-stop. But for this delay Cambridge, 25.3 miles, would have been reached in 30 min., the net gain to locomotive being,



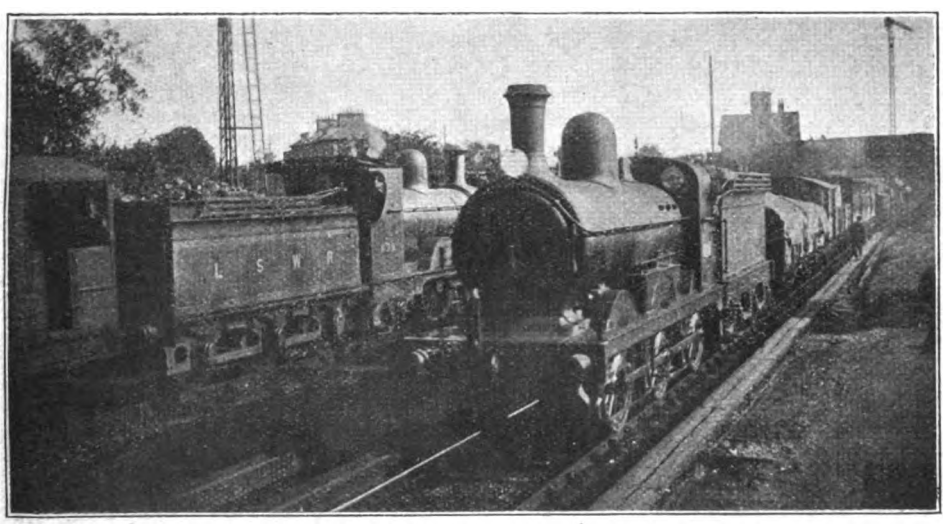
GREAT NORTHERN RAILWAY.

Cleaning 2-6-0 locomotive, No 1041, at Doncaster.

Digitized by Google

therefore, 3 min. on each of the two sections from London, 6 min. in all. My last run on the same train, with No. 1511 and 59 axles, or 385 tons, was by contrast very decorous in character throughout. We passed Tottenham in 12 min. 5 sec., Broxbourne in 26 min. 5 sec., Sawbridgeworth in 37½ min., and reached Bishop's Stortford in 42 min. 35 sec. Thence we passed Elsenham in 9¾ min., at 32 m.p.h., Audley End in 17 min. 20 sec., and Shelford, 22 miles, in 29 min.; Cambridge would have been reached in the 33 min. allowed, but for delays outside. Speed at no point exceeded 60 m.p.h., and schedule times were closely adhered to.

if ever there were one; it must be the regular custom for drivers to give their engines another "notch" somewhere about Broxbourne, with the curious result that the speed on the subsequent decidedly uphill grades is nearly always higher than on the previous practically level stretch! On this occasion Stortford was reached in 41 min. 5 sec. from London, 2 min. early. Thence a very fair ascent was made to Elsenham in 9 min. 5 sec., with a minimum of 34½ m.p.h.; Elsenham to Audley End took 6 min. 59 sec.; and Audley End to Shelford (10.7 miles) 10 min. 31 sec., with a maximum of 67 m.p.h. Once again delays



Photo] [*F. H. Stingemore.*

MIXED RAILWAY WORKING.

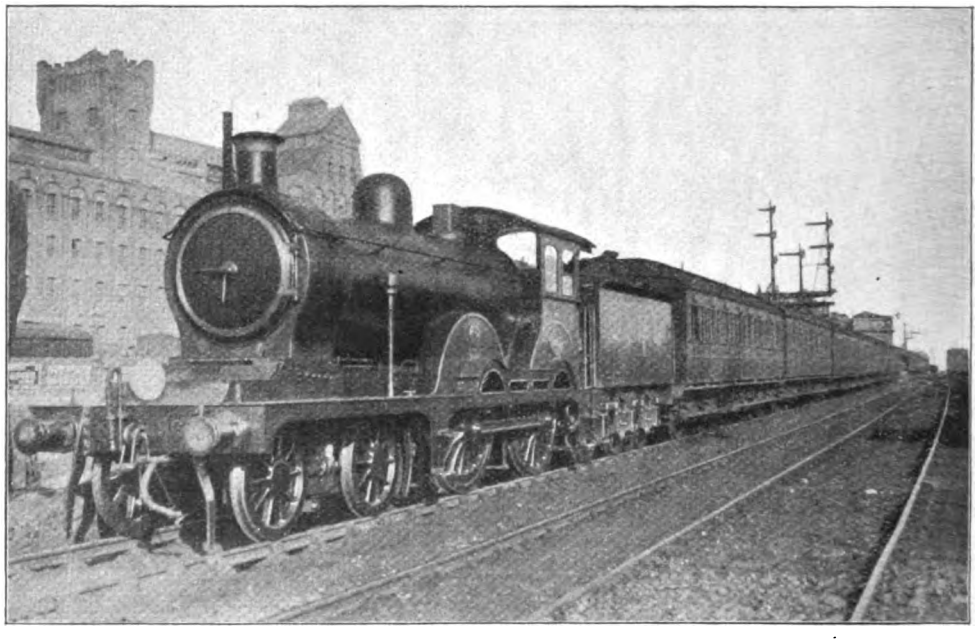
G.N.R. six-coupled locomotive, No. 846, on down goods train near Hounslow, L. and S.W.R., passing L. and S.W.R. engine with G.C.R. brake van attached.

One of my friend's runs on the 2.35 p.m. down, also prior to its deceleration, was a smart effort. The engine was one of the T.19 4-4-0's, rebuilt with superheater (No. 710), and the load 35 axles, or 210 tons. Tottenham was passed in 12 min. 3 sec.; the Tottenham-Broxbourne length occupied 13 min. 25 sec., with an average speed of 50 m.p.h., and the Broxbourne-Sawbridgeworth section 11 min. 9 sec., the average here rising to 51-53 m.p.h. Why is it that this paradoxical state of affairs always obtains in down running on the Cambridge line? Surely this is a case of "tradition" in driving, supervened before Cambridge, which would otherwise have been reached in 31 min.—a second gain to engine of 2 min.

In the up direction No. 1508 did very well on the heavy 12.30 p.m. from Ely to London—with a mixed load of 63 axles, or 380 tons full. From Cambridge Whittlesford, 6.7 miles, was passed in 10 min. 35 sec., at 49 m.p.h.; Audley End, 14 miles, in 21 min. 10 sec.—speed having fallen to 33½ m.p.h. on the 6 miles' ascent to Littlebury, the last 2¼ of which are inclined at 1 in 163-135—Elsenham, 20.1 miles, in 28¾ min., at 41½ m.p.h. (there is another 4½ miles' ascent to this

Digitized by Google

point, mainly at 1 in 176-254), and Stortford, 30.3 miles, was reached in 34 min. 10 sec., after a maximum of 62 m.p.h. at Stansted. Schedule is 36 min. From Stortford No. 1508 passed Sawbridgeworth, 3.7 miles, in 6 min. 25 sec.; Broxbourne, 13.3 miles, in 16½ min. at 60 m.p.h.; and Tottenham, 24.4 miles, in 28½ min. Thence the usual junction slacks were observed, and Liverpool Street, 30.4 miles, was reached in 39 min. 25 sec., a further gain of 1½ min. to engine. Prior to the withdrawal of the restaurant cars, No. 1510, with 52 axles of corridor stock, or 365 tons in all, certainly not have exceeded 38 min., and the aggregate net economy on schedule was, therefore, nearly 5 min. On yet another occasion No. 1521 had an enormous load of 14 corridor 8-wheelers and two 6-wheelers, this 62-axle train being crammed with passengers, and having a gross weight of fully 440 tons. Whittlesford was passed in the good time of 10 min. 50 sec., but speed did not rise above 45 m.p.h. here, and fell to 36½ at Littlebury. So it took 21 min. 50 sec. to get through Audley End, 30 min. 5 sec. to Elsenham, and 35 min. 55 sec. to Stortford, but this figure was



Photo] [*W. H. C. Kelland.*

GREAT EASTERN RAILWAY.

4-4-0 locomotive, No. 1861, on up "slow" at Cambridge.

passed Whittlesford in 10¼ min., Audley End in 20¾ min., and Elsenham in 27 min. 25 sec., reaching Stortford in 34 min. 10 sec. Schedule time to this point was then 35 min., and on to London 42 min. From Stortford Sawbridgeworth was passed in 6 min. 5 sec.; Broxbourne in 15 min. 55 sec.; and Brimsdown, 19.6 miles, in 22¼ min.; but subsequent delays caused the remaining 10.8 miles into Liverpool Street to occupy 22 min. 10 sec. Net time from Stortford to London on this occasion, with so fine a start, would just inside booked time. After Stortford a very thick fog was encountered, and robbed the remainder of the journey of all interest from a timing standpoint.

Some good work used to be performed on the last remaining non-stop express from Cambridge to London—the 9.5 a.m., allowed 74 min for the run—and of this several specimens are given, all behind "Claud Hamilton" class engines. Two in particular may be cited, behind No. 1858, with 44 axles, or 280 tons full, and No. 1791 (fitted with the Weir apparatus)

Digitized by Google

and 42 axles, or 275 tons. Whittlesford was passed in 10 min. 5 sec. on both runs; Audley End in 20 min. and 19 min. 40 sec.; Elsenham in 27 min. 40 and 5 sec.; and Stortford, at reduced speed, in 33 and 32¾ min. Minima at Littlebury were 39 and 38½ m.p.h., and at Elsenham 39 and 43½ m.p.h. respectively. Sawbridgeworth, 29 miles from the start, was passed in 37 min. 35 sec. and 36 min. 55 sec., and from there the 9.6 miles to Broxbourne occupied 9 min. 25 and 40 sec.; the 7.6 miles thence to Ponders End, 7 min. 0 and 5 sec.; the 3.8 miles on to Tottenham 4 and 3¾ min.; and the final 6 miles into Liverpool Street 12 min. 5 sec. and 10 min. exactly. Tottenham, 49.7 miles from Cambridge, was, therefore, passed in 58 min. and 58 min. 25 sec., and Liverpool Street was reached in 70 min. 5 sec. and 68 min. 25 sec. respectively, the running over the concluding length having been unusually fast on the latter occasion, when over 5½ min. were economised on schedule.

On the 10.4 a.m. up No. 1855, a "Claud Hamilton" 4-4-0, now superheated, made some fine running with a substantial train of 46 axles, weighing in all 275 tons. Whittlesford was passed in 10 min. 10 sec.; Audley End in 19 min. 23 sec.; Elsenham in 26 min. 48 sec.; and Stortford was reached in 32¼ min.—2¾ min. inside the schedule of 35 min. then current. From Stortford Sawbridgeworth passed in 5 min. 52 sec.; Broxbourne, 13.3 miles, in 15¾ min.; Tottenham, 24.4 miles, in 26¾ min.; and Liverpool Street was reached in 38 min. 40 sec., 3¼ miles inside schedule. Total gain to engine in this case was, therefore, 6¼ min., and on such form a non-stop run to town might have been completed in 67½ or 68 min. Some still faster running was made by No. 1900, *Claud Hamilton* himself, on the now withdrawn 5.58 p.m. express to St. Pancras, but in this case with a much lighter load of 26 axles only, or 175 tons. Whittlesford was passed in 8 min. 55 sec.; and Audley End in the unusual time of 17 min. 50 sec.; but the train was brought almost to a stand at Elsenham owing to the brakes leaking on, so that the total time to Stortford was 35 min. 35 sec. On the second stage Sawbridgeworth was passed in 5 min. 10 sec., Broxbourne in 14 min. 20 sec., and Angel Road, 22.7 miles, in 23 min. 20 sec.—that is, "even time" had been all but achieved—but subsequent delays spoiled the finish of the run.

I will conclude with a couple of runs on the 7.56 a.m. from Cambridge to London, which before its retiming made some very smart runs, calling at Newport, Stortford, and Broxbourne. For the four stages of 15.8, 9.5, 13.3, and 17 miles the respective allowances of time were 23, 15, 17, and 26 min. respectively. On both occasions the load was one of 35 axles, or 230 tons, the engine on the first run being rebuilt T.19 4-4-0, No. 1028, and on the second "Claud Hamilton" No. 1898, rebuilt with Belpaire boiler and superheater. From Cambridge Whittlesford was passed in 9 min. 35 and 5 sec.; Audley End in 19½ min. and 18 min. 55 sec.; and Newport was reached in 21 min. 40 sec. and 21 min. exactly. Restarting from Newport the 4.3 entirely ascending miles to Elsenham were breasted in 8¼ min. and 7 min. 50 sec., and arrivals were effected at Stortford in 13 min. 50 and 20 sec. respectively. The next stage to Broxbourne was in both cases run very smartly indeed, Sawbridgeworth being passed in 5 min. 35 and 20 sec., and the 13.3 miles completed in 15 min. 25 and 10 sec. respectively, start-to-stop. Out of Broxbourne Ponders End, 7.3 miles, was passed in 9 min. 10 sec. and 8 min. 55 sec., and Tottenham, 11.1 miles, in 12 min. 50 and 45 sec. Both runs were delayed in their concluding stages, but the net times from Broxbourne to Liverpool Street did not exceed 24 min. at most in each case. No. 1028 had, therefore, economised 6 min. in all on these smart schedule times, while No. 1898 had no less than 7½ min. to her credit. Such running as is embodied in these logs may show Great Eastern running in an entirely new light to some readers, for it is a line on which, beset as it is with obstacles to high speed, a good deal of really notable work is performed at times in a quiet way.

Digitized by Google

East to West via Switzerland.

By EDWIN J. MILLER.

IN considering this route we find marked contrasts with that of the North to South route described in the RAILWAY MAGAZINE, June, 1918.

The East to West route passes through the most densely populated portion of the Confederation, reaching all the larger cities with but two exceptions. While the gradients are in many places severe—*i.e.*, up to 1 in 100—there are none of the "mountain grades" that are met with on the fifth section of the Swiss Federal Railways. The line in its eastern section, to Zurich, runs mostly through a hilly neighbourhood. The height at St. Gall being over 2,200 feet, then follows as far as Berne an easier section through the less hilly approaches of the Alps.

From Berne to Lausanne the line is hilly, and has severe gradients, while the last piece to Geneva parallels the lake of that name, but with heavier gradients than such a course would suggest. The geographical arrangements of the operating divisions of the Swiss Federal Railways is such that on our journey we shall traverse the main line of the first four out of five. With four exceptions, the entire route is double track, three of the single-line sections are found on the fourth division, the traffic here being less intense owing in part to the smaller population and comparatively good network of lines over which the traffic is distributed. It is of interest to note at divers stations the use of various words indicating that corresponding to platform—at St. Gall and in this part of Switzerland which is in commercial relationship with Germany the purely German word "Bahnsteig" is used. As we journey westward we find in use at Zurich and Berne a word which is to be found in both the French and German languages—i.e., "Perron." In the French-speaking part of the country—for instance, at Lausanne—the word "Trottoir" (meaning footpath) is used, and at Geneva a word in regular use by the French railways, "Quai," will be noticed.

On this route, serving, as it does, the manufacturing areas, the train service is fairly dense, and the international traffic does not form so large a part of the whole as to be found on the Bale-Lucerne-Italian route. A number of through International services are maintained, the most notable of which are Munich-Geneva-Lyon-Marseilles, Berlin-Nuremberg-Zurich-Milan, and Dresden-Munich-Zurich-Geneva.

The following table gives the distances, stations stopped at and times, and indicates the divisions traversed, the last column is the speed between stopping points:—

Date—July-September, 1914.

Miles.	Stations.	Arrive.	Depart.	D.vs.	M.p.h
0.0	St. Margrethen	—	11.00	IV.	—
6.8	Rorschach ...	11.13	11.19		31.7
16.4	St. Gallen ...	11.45	11.50		22.1
35.2	Wil	12.23	12.25		34.1
52.0	Winterthur ...	12.51	12.57		38.7
68.7	Zurich	1.30	1.45	III.	30.3
84.5	Baden	*	2.08		41.2
99.4	Aarau	2.34	2.36		34.3 } 37.6
107.9	Olten	2.50	3.02		36.4
149.2	Berne	4.12	4.22	II.	35.4
169.2	Fribourg ...	4.59	5.02	I.	32.4
209.7	Lausanne ...	6.15	6.30		33.3
247.0	Geneva	7.22	—		†44.2

* Stops to take up only. † Best run 44.7 m.p.h.

This train, known as No. 14, only runs from St. Margarethen to Rorschach between June 21st and August 31st when conveying a through carriage from Berlin to Lucerne—at other times it commences its journey at Rorschach. Space does not permit of its composition being given in detail, as the train is re-marshalled at the stations of Zurich and Berne. Besides the carriage above mentioned, it conveys as far as Zurich a Swiss restaurant car and two 1st and 2nd composites, three 3rd class, and one luggage vehicle, reinforced at Winterthur by two composite and three 3rd class carriages, with postal carriage from Romanshorn. At Zurich all the vehicles are detached except two 1st and 2nd composites, one from Rorschach, the other from Romanshorn, and in its place train receives four other 1st-2nd class vehicles, with one postal and one luggage van, the entire

Digitized by Google

composition working through to Geneva. At Berne and Lausanne passenger coaches are added as and when necessary, including regularly at the latter place a through carriage from Milan via the Simplon route.

It will be observed that from Zurich the train is 1st and 2nd class only.

Third-class passengers travel from Zurich by a succeeding train, reaching Geneva 1 hour 53 mins. later.

Our starting place, St. Margarethen, is the frontier station for trains from Germany and Austria, the traffic from the former passing round the head of Lake Constance via a short stretch of the Austrian State Railway. In regards to goods traffic, many delays have occurred of recent years owing to the Customs examination, to obviate which the Swiss Federal Railways now operate a ferry service from Rorschach (to which reference will be made later) to Lindau, in Bavaria, doing away with the journey of some 10 miles through Austrian territory. The passenger traffic dealt with at St. Margarethen is of less importance than that transacted at Buchs, 23.6 miles to the south, and served by the same line of the Austrian Railways. The station is unpretentious, but sufficient, and has a small locomotive shed. This point, 1,328 ft. above sea level, is almost the lowest point on our journey, and to Rorschach—7 miles—the gradients are practically level. From here to St. Gall, 9.5 miles, the gradient is severe, the line having to surmount the range of mountains bordering on Lake Constance. Rorschach is an important point of exchange both for Lake traffic and for the line to Constance and Schaffausen. There are two stations, that of the harbour being about half a mile from the town station. Recently the town station has been considerably enlarged, and now possesses a number of island platforms. Another small railway terminates here—that of Rorschach-Heiden. This line ascends the hilly slopes by means of a cog-wheel arrangement and is the only railway in Switzerland (so far as I am aware) using regularly double-deck carriages. These are of a similar style to those employed, up to a recent date, on the Ceinture Railway of Paris. Between Rorschach and St. Fiden, where the Bodensee-Toggenberger Railway joins from Romanshorn (10 miles from Rorschach along Lake Constance) the line ascends through the narrow valley of the Steinach at a uniform gradient of 1 in 50, embankments and cuttings being traversed in rapid succession, the journey affording excellent views of the Lake of Constance and its northern bank.

St. Fiden station has, since the opening in 1910 of the "Toggenberg" Railway, been entirely rebuilt, with two platforms and four tracks. It forms part of the eastern suburbs of St. Gall, between which the railway is carried by means of the Rosenberg Tunnel.

So far the line has been of single track, but double track is in use to Bruggen, on the western outskirts of St. Gall. The conversion from single to double track of the Rosenberg Tunnel is of interest.

Previous to April, 1912, a single line tunnel was in use, passing for most of its distance on the south side of the St. Jacobs Street. The opening up of this tunnel for two rails with existing traffic was impossible, so a new double-track tunnel a few yards longer than the old was made passing north of the already mentioned street, the old tunnel being now disused.

St. Gall is the headquarters of the fourth division of the Swiss Federal Railways. Besides the Federal Railways and the "Toggenberg" line, which is worked by the State, two metre gauge lines use the station. Since 1910 the station has been entirely remodelled, and is now one of the finest in Switzerland. Five platform lines are in use, in addition to a special station for the narrow gauge lines to Trogen and Appenzell, which—except in the vicinity of the station—traverse the public streets. Connection between the two systems is made by an overbridge and several subways, their operation being entirely separate. Concurrent with the new station, a new post office has been erected, the two being connected by subways, so that postal matter can be exchanged without fouling the tracks or platforms. The new station was commenced in 1911 and finished in October, 1914, the total cost being about 9,600,000 francs. The interior is replete with every convenience for the passenger, the embellishments including a series of paintings representing beautiful scenes from each of the Cantons. It was built from designs by the Swiss Federal Rail-

Digitized by Google

way Engineering Department, and owing to certain comments previously levelled against the policy of the Government, nearly all the materials used are of Swiss origin, though one or two innovations have been introduced from the Prussian State Railways, particularly with regard to the provision of sterilised water for use of passengers, and like arrangements of a hygienic nature.

Leaving St. Gall, the gradient is 1 in 100 to Bruggen, before reaching which the "Toggenberg" Railway diverges to the left by means of an overbridge having a separate station about 100 ft. higher. Both these lines cross the Sitter River by very high bridges. The Toggenberg line has massive stone approaches, with steel girdening between the central piers, that of the Federal Railways, crosses the ravine, through which the river runs, by an iron viaduct. This bridge, opened in 1856, has by reason of the development in the weight of the trains become insufficient, and plans are being formulated for its reconstruction as a double track bridge in stone and steel. The bridge is 630 ft. long, and 174 ft. above water level. From Bruggen to Wil the line is single track, but at the time of writing arrangements have been made to lay the additional line. To Wil, 18¾ miles from St. Gall, the line descends chiefly at 1 in 100, and 1 in 120, with one short rise of 2 miles at 1 in 100 before reaching this station. En route we pass Gossau, where a branch diverges on the right to Sulgen, on the Romanshorn-Winterthur line, and on the left to Appenzell, via the Appenzell Narrow Gauge Railway. This line is a competitor to the one starting from St. Gall, which for the most part utilises the public roads, while that from Gossau is of ordinary construction. At Wil a line of the Federal Railways comes in from Lichtensteig, a station on the already mentioned "Toggenberg" line; also there diverges to the right, or north, the line of the Middle-Thurgovie Co., running to Constance, referred to in the article on the town in the RAILWAY MAGAZINE for January, 1918. A considerable amount of traffic is exchanged with this company, as it provides a direct route between Constance and the southern end of Lake Zurich.

ST. GALL.
Part of temporary station with new signals, &c.

Between Wil and Winterthur (17 miles) the gradient, except for a rise of 2½ miles, descends at the uniform figure of 1 in 100. At Raterschen we enter double track. At the next and last intermediate station, Gruze, two other lines come in, without forming a physical junction. Thus we have four single tracks, of which the two inner form the already mentioned double line section. The southernmost

Digitized by Google

track is that of the Töss Valley Railway, a line since taken over by the State. Upon nearing Winterthur Station the line bends sharply to the left, and on the right receives a branch from Schauffhausen. In the angle thus formed are the locomotive sheds, being of chief importance on the fourth division, whose lines we now quit, there being about 30 locomotives to form the links. The station is an important point of exchange for traffic in the Eastern part of the country, being second only to Zurich, and possesses seven through roads and five platform faces. The name Winterthur is, no doubt, well known to RAILWAY MAGAZINE readers, for here are situated the works of the Swiss Locomotive Co., established in 1872, and are now employing over 2,000 people; also the extensive works of Sulzer Bros., whose marine engines are to be found on practically all the Lake steamers of Switzerland. The works, established in 1834, now employ over 5,000 people. Several other big manufacturing firms are situated here, and these works are connected with the railway system by means of a large number of lines, running in many places through the public thoroughfares.

South of the station are extensive sidings, at the end of which a direct line to Bale diverges on the right. From here to Zurich, 16½ miles, an unusual method of operation pertains. The line forms part of the third division, but is worked over by trains of the fourth division, and the sheds at Zurich regularly stable the necessary engines. This stretch of line is an especially important one, as owing to geographical limitations the approach to Zurich is rendered rather difficult, the conditions of which could hardly be improved upon. There are five intermediate stations, and three of these are junction points. Passing Effretikon, from where an alternative route to Zurich leaves the main line, we reach Wallisellen, junction for a line to Rapperswil, at the southern end of Lake Zurich. At Wallisellen are situated the works of the Swiss Signal Co., who hold almost a monopoly in the manufacture of signals and allied machinery. We now approach Oerlikon, another place of interest, as here are situated the extensive works of the "Maschinenfabrik Oerlikon," the chief makers of electrical railway stock in Switzerland, as well as ordinary types of railway material. It is interesting to remember that the motor bogie-trucks of the L. and N.W.R. London electrical services were constructed here, and shown in the Berne Exhibition in 1914, to which reference will be made later on. At this station, which during 1912 was rebuilt, are accommodated four separate lines, including the two Zurich routes already mentioned, a direct Schaffhausen route, over which an important International traffic is conveyed, and a branch line from Baden. Between Winterthur and Effretikon the line rises at 1 in 83, and descends at the same gradient to Wallisellen. To Oerlikon, and thence to Zurich, it descends chiefly at 1 in 83, with short ascents of 1 in 200. Between Oerlikon and Zurich (3.3 miles) a range of hills intervenes—the former station being about 115 ft. above the terminus at Zurich, which lies in the valley of the River Limatt. A tunnel of 1,053 yards is pierced at the top of a short rise from Oerlikon, and upon emerging from it we enter upon a viaduct over 1,400 yards in length, which, forming a curve something like the letter U, crosses the shunting yards and running tracks, and joins the latter about 4,000 ft. from the station. Another viaduct carrying the direct line from Rapperswil, already mentioned, parallels our own, but at a lower level, for most of the distance. The gradient on the former viaduct is 1 in 80, and its height and number of arches makes it an engineering feature of no mean repute.

Zurich-Hauptbahnhof—i.e., main station—is the headquarters of the third division of the State lines, over which we shall journey as far as Olten, about 39 miles. It is the largest traffic centre in Switzerland, the number of arrivals and departures at the passenger station being 354 trains daily, and at the goods station 99. Of these 186 travel over the viaduct already described, coming from four directions. In all, the trains originating here serve ten different routes, the station being the centre of a comparatively big network of lines. These routes do not immediately radiate from Zurich, but use common tracks for some distance, so that the traffic on the four main arteries roughly serving the points of the compass is, with the exception of the Rapperswil direct line, fairly heavy. The station was originally built in 1847, when the first line of railway in Switzerland was

Digitized by Google

opened from here to Baden, 15.8 miles. Somewhat like many of our own stations, it has from time to time been enlarged, so that it is now rather irregular in plan, the outer platforms being situated at a greater distance from the circulating area than those laid out under the original roof. A portion of the old station serves as a concourse and luggage office. The best resemblance the writer knows is that conveyed by the Nord station at Brussels, the general "ensemble" being almost identical. The main station (there are eleven other stations with the prefix "Zurich") takes first rank for all classes of passenger business, as well as the number of goods vehicles dealt with. The departures of passengers in 1913 (arrival figures are not carried in Swiss official statistics), the last date available, was 4,489,200. Beyond the station proper is situated the extensive marshalling and goods yards and locomotive sheds, the latter providing 79 locomotives daily for the working of the traffic. Very extensive alterations are now in course of progress providing for the complete separation and at different levels of the passenger and freight tracks and yards, for "ramp marshalling" yards, for separate running tracks for each of the four main arteries mentioned above, and for increasing the number of platforms from 9 to 22. Also a new locomotive shed, with provision for 60 engines, will be erected, and various "flying-junctions" to alleviate conflicting movements, much of the traffic entering and leaving the station being operated under the same disadvantage as that of Cannon Street, S.E. and C. Railway. This project has been under discussion since 1895, and has been delayed through it being necessary to reconcile a number of conflicting authorities as well as to secure the most satisfactory solution.

As in Swiss practice certain platforms are allocated to particular services, a large amount of breaking-up and reforming of trains is necessary with the through services in order that the departing train may run from its particular platform. Upon arrival the engine of the fourth division which has brought us from St. Margrethen is detached, and as this is a terminal station another engine is attached at the rear. The train is then re-formed as indicated earlier in the article, and drawn alongside the departure platform. An express locomotive of the third division will take the train to Olten, stopping en route at Baden and Aarau. The stop to take up only at Baden is an unusual feature, only three trains thus being scheduled. The gradients to Olten are not unduly severe, a gradual descent up to 1 in 250 is made to the point where the River Reuss empties into the Aare, situated near Brügg, 18¾ miles. From here the line ascends as far as Wildegg (6 miles) at 1 in 160, and thence to Aarau (5¾ miles) at 1 in 100, and on to Olten at gradients of 1 to 160 to 1 in 120. At Altstetten, first station out from Zurich, a branch goes off on the left to Zug, all the other routes branching out within the station limits. The station before Baden—that of Wettingen—is a junction point of some importance. Baden Station, like that of Zurich, retains several features reminiscent of the first Swiss railway, particularly of the old wooden roof which spans both platform and tracks. The well-known mineral springs make this an important traffic centre, as well as that due to the adjacent works of Brown, Boveri and Cie, which cover an area more than equal to that of the town. The firm was founded in 1891, and now employs in their Swiss works over 5,000 workmen. Making electrical apparatus of all kinds, that of the most interest to the railway student is the electric locomotives and overhead equipment, as well as train lighting system, the latter employed almost exclusively on the Swiss Federal Railways, and very largely on the Paris-Orleans Railway.

Continuing, we pass Turgi, a junction for Koblenz (Switzerland), a station on the direct Winterthur-Bale line, and reach Brügg. From here lines diverge to Arth-Goldau on the fifth division and to Bale; the latter line after crossing the Aare can be observed for some miles steadily climbing at 1 in 80 the slopes of the Botzberg. Passing two junction stations of Wildegg and Rapperswil, the train halts at Aarau. At this station, besides the State line, two metre gauge lines connect, and goods traffic from the latter is handled by means of the transporter-trucks which enable the narrow gauge vehicles to be conveyed over the ordinary system. Two or three small stations are passed before reaching Olten,

Digitized by Google

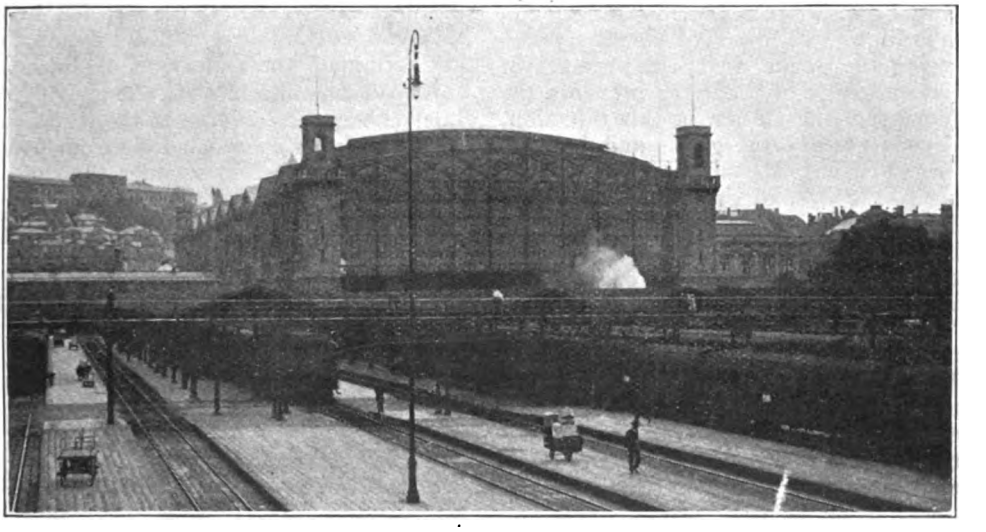
where the lines of the second division are entered upon, and our present locomotive detached. This station was referred to at some length in an article entitled "North to South via Switzerland," as well as the short section of line to the next station, Aarburg.

From Olten to Lausanne two routes exist, that via Berne to be described, and one of almost equal importance via Soleure and Neuchatel. Often trains are divided at Olten, and travelling via both routes reach Lausanne, and are there coupled-up or run independently to Geneva, reaching there within a few minutes of each other. If this procedure is not followed, a train from Bale to Geneva and one from Zurich to Geneva over the river of the same name and enters Berne Station.

On this section of the line from Olten to Berne occur the largest number of non-stop services—viz., 16—the fastest covering the distance in 67 mins., 37.2 m.p.h.

En route we pass Langenthal, a station from which several standard and metre gauge lines radiate. It is a manufacturing centre of some note, and its development has brought about quite a number of light railways in the vicinity.

At Herzogenbuchsee (17½ miles from Olten) a branch of the Federai Railways runs to Soleure, which is served by the alternative route from Olten mentioned above. Ten and one-quarter miles further the important centre of Burgdorf



ZURICH (MAIN) STATION.
Note separate luggage platforms.

will then exchange traffic at Olten, and afterwards proceed by either route. Stopping at Olten 12 minutes and attaching another locomotive, the train proceeds to Berne over a practically continuous rising grade to Zollikofen, 36.6 miles. From Aarburg, where our line turns out from that to Lucerne, the gradients ascend at inclinations between 1 in 170 and 1 in 100 to Burgdorf, between which and Zollikofen a short descent of 3½ miles at 1 in 200 is followed by much the same rise.

Between here and Berne, some 4 miles odd, the train descends a short bank of 1 in 100 into the Aare Valley, and, rising at the same inclination, crosses a bridge is passed, where we intersect the line of the Burgdorf-Thun Co. This was the first line in Switzerland to be constructed for electrical operation upon the standard gauge—it forms from points north of Burgdorf a more direct line to the Loetschberg Railway than does the Swiss Federal via Berne. Being so, certain classes of goods traffic are worked via this private railway, which, in effect, relieves the congestion experienced at the approaches to Berne Station, as well as providing a shorter mileage.

At Zollikofen, already referred to, a secondary route from Bale via Bienne comes in, over part of which the trains

Digitized by Google

from Paris to Milan via the Loetschberg route run. Connection is also made with the Soleure-Berne Electric Railway, the most recently opened of Swiss metre gauge lines. Traffic is exchanged by means of the "transporter" trucks referred to in describing the station at Aarau. At Wilerfeld, a block post only, a junction is effected with the line coming from Interlaken. Till 1913 this was in the nature of a branch line, but now forms part of the Loetschberg route to Italy. Lucerne is also reached via this line, a further junction being made at Gumligen, 5 miles from Berne. It will be seen that as far as Wilerfeld through trains from north to south enter and leave Berne over the same tracks.

Immediately before entering the station at Berne we pass over the Aare by an iron bridge, the lower of its two floors carrying the public road; the presence of the deep gorge of the river prevents the extension of the station in this direction, and consequently the goods and locomotive departments are situated at some distance to the west of the station.

Berne is the capital of the Confederation, and above the station is situated the general offices of the Federal Railways. As originally built, the station was a "terminus," the trains entering and leaving at an angle resembling the letter "V." That portion of the old station was, after rebuilding, retained for much the same purposes as at Zurich, the present situation suggesting the letter "T," the tracks occupying the "top stroke," while the circulating area, ticket, and other offices being grouped at right angles to the station proper. On the south it butts upon the main artery of the city, while on the north a heavy retaining wall is necessary on account of the contour of the ground. It has nine platforms and eleven roads, all of them being "through tracks." During the summer of 1914, 282 trains of all descriptions used the station, of which 177 leave and depart over the river bridge just described. Of the total 62 trains are of the private-owned company, the Berne-Loetschberg-Simplon Railway, their trains having running powers to the junction point of Weirmannshaus, where is situated the goods station. Owing to the "bottle-necks" experienced on each side of the station traffic is difficult to work, as for the most part the train services start and finish here, except for the through service of which the train being described forms a part. The approaches to the Aare bridge are frequently occupied in making-up respective trains, the carriage sidings being at Villette, about ¼ mile west of the station. The station itself is provided with ample subway and platform accommodation, and through the necessities of the situation is laid out on a distinct curve. The train halts here 10 minutes, during which time the engine attached at Olten is taken off and one of the first division is put on, over the lines of which we shall complete our journey.

Leaving the station to continue, we pass Villette and the sheds for the engines of the second district, the service being so arranged that first division engines do not terminate their journeys at Berne.

At Weirmannshaus the trains of the Loetschberg Co. diverge to the right, and almost at once a branch therefrom leaves on the left, and passes under the line on which we travel. This line forms an alternative route to Thun, but no real competition is made with the direct State-owned line. The village of Schwazenburg is reached by a branch line from the first station along this route. The route, continuing directly west from the aforementioned junction, goes to Neuchatel, and over this line the P.L.M. through traffic to Paris is conducted. Five and one-half miles from Berne we pass Thorishaus, and enter upon the last section of single track, which continues to Siviriez, 32 miles distant. The next station of Flamatt is a junction for a small line which runs to a station on the Neuchatel direct line.

Before reaching Fribourg, our next stop, two matters of interest engage our attention. At the station of Guin (Dudingen) we pass, as it were, "a frontier within a frontier," for our journey east of this small station has been through the German-speaking part of Switzerland, while the rest of our ride to Geneva will be through that part of the country in which French is the acknowledged language. En passant, it is of interest to note that the line of demarcation is quite distinct, and upon the Simplon route a somewhat extensive forest, which strikes across the valley of the Rhone

Digitized by Google

there, forms the boundary. Owing to this peculiarity the working time-tables, so far as they relate to instructions, of the first and second divisions are printed in both French and German. The second is that of the imposing viaduct of Granfey, which crosses the deep gorge of the River Saane—the viaduct is built entirely of iron, and is 1,080 ft. long and 250 ft. above the level of the river. Fribourg is the junction of a cross-country line to Yverdon, like that of Neuchatel, situated on the alternative route to Lausanne, which diverges at Olten. A third line—that of a local electric railway—also uses the station, being of the normal gauge. tion for a parallel line of the Federal Railways which runs to Soleure (77 miles), between that over which we have travelled and the line passing through Bienne-Neuchatel-Yverdon. The narrow gauge Gruyere Railway also forms a junction at Palezieux. Midway to Lausanne, viz., Puidoux-Chexbres, a private line worked by the State runs to Vevey, some 4 4-5 miles away. This line has the very steep gradient of 1 in 26, the difference in elevation being more than 750 ft. Leaving Puidouz, and threading the Cornallaz Tunnel, the line runs high above the Lake of Lausanne, affording a view of singular beauty, embracing the

BERNE STATION.
Note "X" shunting signal.

Continuing, we pass Romont, where a branch diverges to Bulle, made familiar to English people as the home of Caillier's chocolate. The next station, Siviriez, commences double track, and the succeeding one of Vauderens is the culminating point of a rise at almost continuous gradients at 1 in 100 from Berne, exception being made to a descent from Thorishaus to Flamatt, 2½ miles, also at 1 in 100. Approaching Fribourg the line stiffens to 1 in 80. From Vauderens the line descends to Palezieux at 1 in 90 (6¼ miles), ascends at 1 in 140 for 2⅜ miles, and then descends to Lausanne, 10¼ miles distant, at 1 in 55. Palezieux is a junc- greater part of the lake and surrounding mountains. Descending rapidly, we see below at the level of the lake the Simplon line, and, passing over the eleven-arched viaduct near La Conversion Station, effect a junction just outside Lausanne Station. This is the chief station of the first division, and the new station, remodelled and enlarged, was completed in 1914; the old station had four platforms and six roads, and was quite inadequate for the traffic; the new station has seven platforms and eight roads, and accommodates 162 trains daily, the goods traffic being dealt with at the adjoining station of Rennens, a service of shuttle trains for local traffic

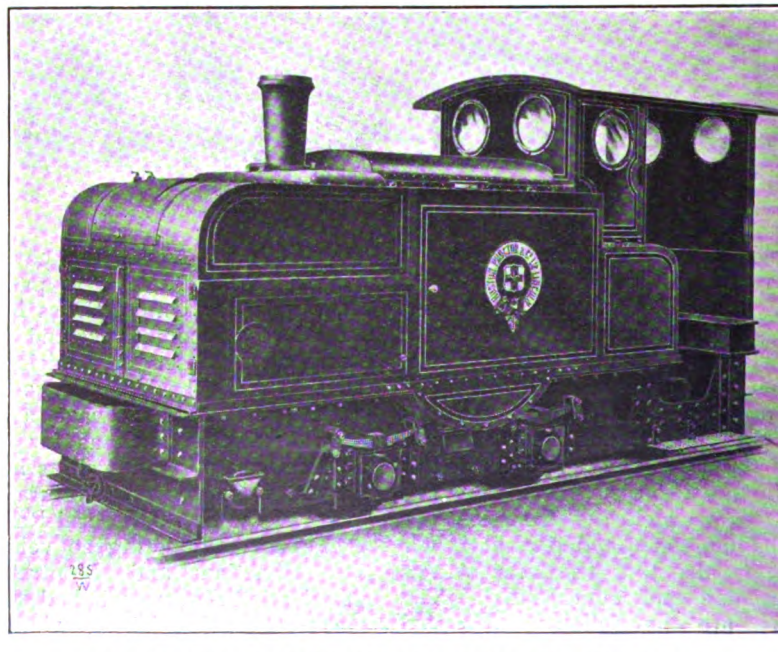
Digitized by Google

the narrow-gauge railways were the most interesting. The observation carriage of the Montreux-Bernese-Oberland Railway and the invalid's car of the Chur-Arosa Railway were both unique in character, the latter vehicle, besides the necessary appointments of such a carriage, had separate apartments for the patient, doctor, nurse, and accompanying friends. In order to reach the Exhibition site a special line of railway was made from the neighbourhood of Villette, about a mile distant, and which also served to convey the other exhibits and building material made necessary. In addition to the rolling stock exhibited a most complete exhibition of statistics, gradient profiles, diagrams and photographs contributed to the undoubted success of this section of the Exhibition.

An Internal Combustion Locomotive.

FOR a powerful oil locomotive on light railways serving yards of different descriptions, power stations, mills, and engineering and industrial works of various kinds there is a distinct demand, and the locomotive illustrated is designed to meet it. Manufactured by Ruston and Hornsby, Ltd., Lincoln, it is fitted with a patented device whereby a variety of fuels may be used.

The engine is mounted upon heavy locomotive pattern plate frames stiffened by angle iron, and supported by powerful springs on two or more axles. Simplicity and strength are the outstanding characteristics of the design, while the extreme compactness of the locomotive enables it to pass through the narrowest clearances. Cost of running is low, especially when using paraffin. A complete system of side-feed lubrication, controlled from the driver's cab, is provided.



RUSTON INTERNAL COMBUSTION LOCOMOTIVE FOR LIGHT RAILWAYS.

Digitized by Google

Some French and Belgian Railway Tickets.

By P. C. L.

ON its lighter side the war has, no doubt, been responsible for an increased interest on the part of RAILWAY MAGAZINE readers in all that concerns the near Continental railways; and as there may be a few points not generally known about French and Belgian railway tickets the writer has ventured upon the following notes.

I.—Chemin de Fer du Nord.

The tickets of this railway are remarkably simple documents, as compared with many English ones, having only five lines of print, none of which requires a microscope to be read. They are printed not

FIG. 1.

horizontally, but across the tickets (figs. 1, 2, 3). Reading downwards, we have (1) the station of departure; (2) the destination station; (3) the class of carriage for which the ticket is available; (4) the "category" of passenger; and (5) the fare. In addition to all these there is a large numeral. Each class has a particular colour associated with it: 1st class, yellow; 2nd class, green; and 3rd class, brown; while of each class there are normally three categories of passenger: (A) the ordinary passenger who pays full fare—his ticket is completely yellow, green or brown, as the case may be, and bears in

FIG. 2.

the fourth line the legend "place entière" (whole place) (fig. 3); (B) the passenger who pays half fare (e.g., children and workmen)—these tickets are half white

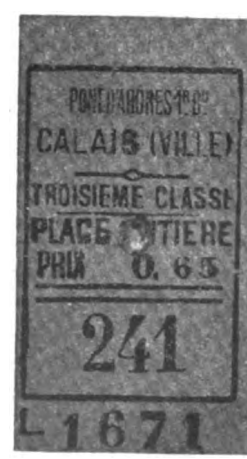


FIG. 3.

Digitized by Google

and half the appropriate class colour, the marking being longitudinal, and bear the legend "demi place" (half place); (C) the military passenger at quarter fare—his ticket is also half and half in colour, but is marked diagonally (figs. 1 and 2), and it bears the word "militaire."

The large numeral on most French tickets has possibly puzzled some of our readers before now. The explanation is as follows. Each station on a system has a number assigned to it, and on all tickets issued to that station this number is printed in large type, thus all tickets to Corbie bear the number 201, to Amiens 128, to Calais (Ville) 241, and so forth (figs. 1, 2, 3). Probably this is to facilitate the work of the ticket collectors.

II.—Chemin de Fer l'Etat.

This railway system has the same arrangement of class colours and "categories" as the Northern system. The tickets, however, are printed differently,

FIG. 4.

the words running horizontally (fig. 4). The top half of the ticket shows the points of departure and arrival in clear type, while the lower half is divided into three sections. The first contains in ordinary tickets the name of the railway, Etat, but in the special tickets there is substituted for Etat "demi place" or "militare." The middle portion contains the number of the destination station, while the third has the class and fare.

III.—Chemin de Fer l'Etat Belge.

On this system the ordinary tickets had (or have) the same class colours as the French systems already noted, but the tickets are otherwise entirely different. They are printed in two halves, each of which is practically a duplicate of the other (fig. 5). This enabled the ticket when cut in half to be used as two half

FIG. 5.

tickets. The date is stamped along the side. The ticket shown was issued from Ypres to Zonnebeke before the war, and is of especial interest to us in these days.

N.B.—The military tickets shown above were obtained while the writer was on leave in France, and give no clue to the position of any British troops.

Digitized by Google

The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Before asking for information concerning railway history and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," the twenty-first annual edition of which is on sale, price 5s. net, by post 5s. 6d. The book, however, is nearly out of print, and very few more copies are available. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

North Eastern Railway "Atlantics."

There are nominally three 4-4-2 classes on the N.E.R., but actually four. Nos. 295, 532, 649, 742, 784, 1680, 1748, 1753, 1776 and 1792 comprise the original class V, with two cylinders, 20 in. by 28 in.; these engines were built between 1903 and 1905, and are mostly now superheated. Class V also includes Nos. 696 to 705, built in 1907, although these have 19½ in. by 28 in. cylinders, and are externally quite distinct from the original V's; all the latter are now superheated. Class 4 c.c. consists of two 4-cylinder compound engines on the Smith system, now superheated, Nos. 730 and 731.

Latest "Atlantics" are the "Z's," each with three high pressure cylinders. Nos. 706, 709, 710, 714, and 716 to 721 were the original Z class engines, not superheated, and with 15½ in. by 26 in. cylinders, whereas Nos. 722, 727 to 729, and 732 to 737 were classed Z1, and had 16½ in. by 26 in. cylinders and superheaters, but were otherwise identical; all these 20 engines were built by the North British Locomotive Company. Now that the original Z's have been superheated, the whole of the 3-cylinder engines are uniformly classed as Z, and have been subsequently added to by Nos. 2163 to 2172, and 2193 to 2212 inclusive, total 50 engines. With the 20 engines of class V and the two compounds, there are, therefore, 72 "Atlantics" in service on the N.E.R.

[Reply to M. H.]

Hounslow Branch, Metropolitan District Railway.

Formerly the railway ran as marked on the maps mentioned by you. The line was opened from Acton Town (then Mill Hill Park) to Hounslow Town May 1st, 1883. The line to Hounslow Barracks was formed as a branch line, the actual junction being at Lampton Signal-box, the junction from the passengers' point of view then being at Osterley.

Splitting of the trains between Hounslow Town and Hounslow Barracks was obviously uneconomical, and not in the public interest, especially as there was afterwards provided a Hounslow Town station on the direct line to Hounslow Barracks.

The old Hounslow Town station is now dismantled, and the branch will, some day, doubtless, form a goods yard.

For steam working a run-round road existed at Hounslow Barracks, but as this is not necessary with electric working, and, as a matter of fact, there is now no signal-box in operation at Hounslow Barracks, the points and run-round road were all taken out.

The single line in question has the reputation of being the hardest worked single line in the world, there being a six-minutes' service over it in each direction, morning and evening, and at least a ten-minutes' service throughout the remaining working hours of the day.

[Reply to "DISTRICT."]

Digitized by Google

Stratford and Moreton Tramway.

This was opened for traffic in 1826, and was part of an ambitious project for connecting the coalfields of the Black Country and Warwickshire with London. It ran from Stratford-on-Avon to Moreton-in-Marsh, a distance of some 16 miles; from a point near Ilmington a branch diverged to Shipston-on-Stour. Never successful financially, it passed successively into the possession of the "Oxford, Worcester and Wolverhampton," the "West Midland," and the Great Western Railways, and has been closed to traffic for many years; the portion between Moreton and Shipston, however, was connected in 1889 to a passenger railway, and is still in use as such. During the past summer the rails and chairs, which were those originally laid down, were removed from the disused section; the stone sleepers have not, as yet, been taken up. There is little prospect of the line ever being reopened, the Great Western Railway having direct connection between its two termini via Campden and the Honeybourne loop; a wholesale realignment and numerous diversions would be necessary to render it suitable for ordinary railway traffic. The line was never worked by locomotives, but entirely by horse traction; a passenger service was tried for a short time some 60 years ago.

[Reply to HARRY F. GREENFIELD.]

Tractive Force.

In full, the tractive force formula for a 2-cylinder engine should read:—

$$T = 2 \times \frac{\text{area of piston} \times \text{2ce stroke} \times \text{steam pressure}}{\text{circumference of driving wheel.}}$$

Using the customary symbols, we have

$$T = 2 \times \frac{.7854\ d^2 \times 2\ S \times p}{3.1416\ D.}$$

Cancelling out, this is reduced to

$$T = \frac{d^2 \times S \times p,}{D,}$$

or, as it is customary to reckon that the steam pressure at the piston is about 80 per cent. of the nominal working pressure,

$$T = \frac{d^2\ S \times p \times .8}{D.}$$

For four cylinders, therefore, this result merely requires to be doubled. Tractive force, or, rather, the pull on the drawbar, is greatest at starting (as the static friction of the journals in the axle-boxes has to be overcome), and also in producing acceleration, but as the rate of acceleration falls, so the drawbar pull falls with it—within, of course, certain well-defined limits, as there are many other forms of resistance to take into account. But the subject is, we fear, too large for us to attempt to deal with adequately in these columns.

[Reply to W. S. UPTON.]

London and North Western Railway Engine Numbering.

Our Crewe correspondent, Mr. C. Williams, writes:—As far as I can make out, the system of shed numbering on the L. and N.W.R. dates back to about the year 1867, and for Mr. Hargreaves' information, append a copy of the original list:—Nos. 1 Camden, 3 Bletchley, 5 Wolverton, 6 Northampton, 7 Peterboro', 8 Rugby, 9 Walsall, 10 Birmingham, 13 Bushbury, 14 Stafford, 15 Crewe, 16 Longsight, 17 Leeds, 18 Birkenhead, 19 Chester, 21 Bangor, 22 Holyhead, 23 Warrington, 24 St. Helens, 25 Springs Branch, 26 Liverpool, 27 Preston, 28 Tebay, 29 Carlisle, 30 Shrewsbury, 31 Hereford. At the above date Nos. 2, 4, 11, 12 and 20 had not been allocated, but have since all been filled in with the exception of No. 11, which for some unknown reason was never used. No. 4 was originally allotted to Oxford and then to Nuneaton. Watford (2W) is a sub-shed to Willesden (2); and Monument Lane (10M) a sub-shed at Aston (10). Llandudno Junction (28) has no sub-shed at Llandudno. No. 36 shed at Ordsall Lane was demolished about 1904.

[Reply to J. HARGREAVES.]

Proposed Central Station at Plymouth.

You are right in saying that it is several years ago since it was proposed to build a Central Station in Plymouth. As a matter of fact, this was part of the original scheme in the Act which incorporated the Plymouth, Devonport and South Western Junction Railway Company in 1883. It was found, however, that the cost of this part of the scheme was prohibitive, and, consequently, in 1889 an agreement was come to between the Great Western, the London and South Western, and the Plymouth Companies

Digitized by Google

for the abandonment of the Central Station, and for the construction of the existing line from Mutley to Friary, and for the working of the traffic as it is now worked from Friary Station via Mutley and North Road to Devonport, and in the same year, 1889, the companies obtained the sanction of Parliament to the abandonment of the Central Station, and the proposed railways in connection therewith.

[Reply to S. BROWNING.]

Solid Bogie Wheels for Locomotives.

These are in no way an innovation, having been used hitherto to some extent on Colonial railways (more especially on narrow-gauge lines, where the bogie wheels of engines are of small diameter), but the only case on record in this country hitherto, so far as we are aware, was that of Dean's 4-4-0 "Pendennis Castle" class on the G.W.R., which were fitted with solid Mansell wheels to the bogie. These have not, however, been retained. Then there are Webb's 0-4-2 shunting saddle tank engines on the L. and N.W.R., of which the rear radial wheels are cast solid. The case to which you refer on the Midland Railway is more probably an experimental set of shields to the wheels, supplementing the shields in front of the leading bogie wheels, which are designed to prevent the pilot of a double-headed train, when taking water, throwing up grit, &c., into the bearings of the train engine.

[Reply to 2nd Lt. A. R. COWLISHAW.]

Central European Railway Conditions.

Doubtless the paragraph you seek was that in the columns of the *Board of Trade Journal*, November 7th. Anyway, it is the only one of the kind we can trace about the date mentioned. It states:—German railway fares do not appear to have been raised until August, 1917, and in the following October a general revision was made. Much heavier charges have been imposed in Austria, demurrage rates going up as much as 200 per cent. in December, 1916. Since then additional charges have been made, with a surtax of 50 per cent. from last December on most passenger rates. In Hungary goods rates and general fares were increased early in 1917, and as from last October the State Railway Administration of that country raised the charges on coal and coke by 40 per cent., rates on other goods going up 70 per cent.

[Reply to "R.V.S.P."]

Fastest Train between London and Carlisle, Midland Railway.

So far as we can trace, the fastest time ever scheduled between London and Carlisle, Midland Railway, was by the summer Highland express, when it left St. Pancras at 7.30 p.m., and reached Carlisle at 1.30 p.m., *i.e.*, six hours, with stops at Trent and Leeds. For one summer, also, the 10.30 a.m. *ex*-Edinburgh left Carlisle at 1.12 p.m. and reached St. Pancras at 7.15 p.m., with stops at Apperley Bridge and Leeds, total 6 hr. 3 min. Latterly the fastest train was the summer 11.50 a.m. express from St. Pancras to Glasgow, calling only at Shipley to change engines, and reaching Carlisle at 5.55 p.m. As regards your second query, see the first part of Mr. Cecil J. Allen's article in the November issue.

[Reply to L. HARDCASTLE.]

Engineer's "Cautions."

We should have thought that the connection between these special indications and the bridge under repair would immediately suggest itself to you. The horizontal green fish-tailed board, showing white and green lights at night, indicates to a driver where he must prepare to reduce speed and the "C," for "commences," illuminated at night, the exact position of the structure or piece of track under repair. At the termination of the slack there is usually an additional sign "T," for "terminates," also illuminated at night-time. Several lines now employ these signs.

[Reply to RALPH B. WALLIS.]

Overhead Electric Traction.

We cannot agree that the overhead system of electric traction is "almost universally adopted now," so far as this country is concerned, at any rate, although it has a greater vogue in the United States. It is a cheaper form of construction, generally speaking, and obviates the difficulties experienced in junction work with the third rail, while a conductor wire has the advantage in severe winters of being less liable to be-

Digitized by Google

come coated with ice than a conductor rail, and thus to hold up the traffic. But the overhead system is less durable, and its maintenance cost is probably higher.

[Reply to E. E. C.]

Thames Haven Branch, Midland Railway, London, Tilbury and Southend Section.

See article, "The Midland Railway and the Tilbury System," in RAILWAY MAGAZINE, June, 1912. At one time the line was of great importance, with a considerable passenger as well as goods traffic. To-day no passenger trains are run. For a short period a few years ago the local residents were allowed, probably without official consent, to use a platelayers' lorry, upon which a mast and sail were erected in order to secure power of propulsion, but when public attention was called to this practice of "sailing on a railway" it was promptly stopped.

[Reply to J. S. SEWELL.]

Railway Curves.

It is now the standard American practice to enumerate or describe curves in terms of angles, rather than by the British method of radii. The degree of sharpness or deflection angle of a curve is the angle subtended by a chord measuring 100 ft. in length at the centre from which the curve is struck. Thus a curve whose deflection angle is, as you state, 18 deg., is such that a triangle formed by a 100-ft. chord as base, and with sides equal in length to the radius of the curve, would contain an angle of 18 deg. at the apex.

[Reply to C. COTTEE.]

Corrugated Signal Arms.

Presumably you refer to the practice of the London and North Western and North London Railways, and, more latterly, of the Midland Railway, in substituting corrugated steel signal arms for the more common wooden pattern. The steel arms have two longitudinal corrugations or recesses, in order to give them added strength. This type of signal arm is not confined to termini and junctions, however; it is universal on the first two railways mentioned, and is in course of general introduction on the Midland Railway.

[Reply to "INTERESTED."]

2-8-0 Engines, Great Central Railway.

The "wedge-shaped projection between the dome and chimney" of these engines, to which you refer, is the top-feed apparatus for delivering water to the boiler, and may be seen on various G.C. locomotive types. For the standard R.O.D. engines now at work in France the earlier G.C. "Consolidation" class was taken as a prototype, and not No. 412, which has a larger boiler. We do not think that any of the other types of which you write have been sent O.A.S.

[Reply to Major H. J. COXHEAD and J. V. HALL.]

London and South Western Railway Rolling Stock.

There is a considerable variation in weight of the vehicles to which you refer, but you may take it as an average that bogie corridor coaches weigh 27-28 tons, bogie non-corridor coaches 21-22 tons, six-wheelers 12-14 tons, and restaurant cars about 34 tons. The locomotive types you cite are all of approximately equal power, nominally, but you must draw any further deductions you desire from published dimensions.

[Reply to R. W. C. and "SLIDE-VALVE."]

Flat-bottomed Rails.

Now that steel sole-plates are almost universally interposed on main lines between the flanges of flat-bottomed rails and the sleepers, corresponding to the chairs employed with bull-head rails, and taking into consideration the fact that a larger number of sleepers is employed on a flat-bottomed than on a bull-head road, there is not very much to choose between the relative cost of the two types of track, when the weight of rails is the same.

[Reply to E. E. C.]

Lettering on Axle-Boxes.

The initials which you have noticed cast on axle-boxes are part of the general, though not of necessity universal, policy adopted by railway companies of distinctively lettering all loose parts of rolling stock, track, &c., and especially such as are obtained from outside contractors. In the latter case confusion might be caused between the material ordered by various companies if this were not done.

[Reply to C. C. S.]

Digitized by Google

Express Tank Engines.

It is not customary to run the large modern main line tank locomotives bunker first on express trains, when it is possible to turn them, as the look-out over a bunker full of coal is not generally as good as in the forward direction, and it is also inconvenient for the driver to stand, as he must do for the purpose of observing the signals, for long continuous periods with his back to the operating mechanism of the engine.

[Reply to WILLIAM STEWART.]

Narrow Gauge Railways.

Generally speaking, the narrower the gauge of a railway, the lighter is its construction, and herein the initial cost is reduced. The effect of this reduced strength in the track, of course, is to impose limitations in axle-loading and in maximum permissible speeds, which is the principal respect in which narrow gauge tracks compare unfavourably with those of standard gauge.

[Reply to G. S. AND W. R.]

London, Brighton and South Coast Locomotives.

No. 597 is one of the earliest batch of 4-4-2 tank engines built for the L.B. and S.C.R. in 1906, with 5 ft. 6 in. driving wheels, for suburban service. Our reply concerning the 2-6-0 engines referred only to the first batch built of these locomotives, but you are correct in stating that the series now runs from 337 to 346 inclusive.

[Reply to M. J. BIZERAY.]

4-6-0 Engines on the Great Northern Railway.

We think it improbable that this type of engine is contemplated on the G.N.R. It is highly improbable that any of the existing G.N. "Atlantics" should be converted to the 4-6-0 wheel arrangement, as thereby it would be necessary to dispense with the wide firebox, which is one of their main features.

[Reply to A. F. H. BRISCOE.]

Midland and Great Northern Railway Locomotives.

Locomotives principally employed on this railway are 4-4-0 tender for passenger service, and 0-6-0 tender for goods.

[Reply to "INTERESTED."]

British Permanent Way.

There is Mr. Cecil J. Allen's book, "Modern British Permanent Way," with its sub-title, "Notes on its Design and Manufacture." This book is published at 6s. net, by post 6s. 6d. It treats of rails, chairs, fishbolts, fishplates, keys, sleepers, ballast, rail-joints, switches and crossings.

[Reply to FRANK UZZLE.]

Sleeping Cars, East Coast Route.

Sleeping cars are run on the 7.0, 10.15, and 10.30 p.m. expresses from King's Cross to the North, and on the corresponding up trains due in London at 6.10, 7.15, and 7.35 a.m. If by saloon carriages you mean the open corridor third-class coaches previously employed on East Coast trains, these are still in use.

[Reply to A. F. H. BRISCOE.]

Train Control.

The L. and Y. Railway has a train control system in force with separate telephone circuits for control purposes of a selective type as designed by the company's staff. Direct telephonic communication is established between the Central Control Office and every signal-box and siding on the system.

[Reply to E. A.]

Westinghouse-fitted Locomotives, Great Northern Railway.

So far as we know, 0-4-4 tank engines, Nos. 767 and 931, are the only G.N. engines fitted with this brake. As they are also vacuum-fitted, you would obviously only hear the pumps at work when they were hauling Westinghouse-fitted stock.

[Reply to R. A. KINDON.]

South Eastern and Chatham Railway 2-6-4 Tank Engine.

The photograph reproduced as frontispiece to the May, 1918, RAILWAY MAGAZINE was taken in strong sunshine, and what you mistake for a fracture of the driving crank is caused by the shadow of the oil cup above the big-end of the connecting rod.

[Reply to CYRIL HAMMOND.]

London and South Western Railway Engines.

There are no published lists of this company's locomotives.

[Reply to "ST. CROSS."]

Digitized by Google

Rebuilt T19 Class Engines, Great Eastern Railway.

Only five of above engines which were rebuilt with the 2-4-0 wheel arrangement are now extant—Nos. 702, 725, 771, 776 and 778. The remainder have been scrapped, although there is a large number still in existence, of course, rebuilt as 4-4-0 engines.

[Reply to R. GOODCHILD.]

Proposed Railway Extensions from Plymouth.

We cannot say that there is a probability of the line from Plymouth (Millbay), Great Western Railway, to Yealmpton being extended to Modbury and to Dartmouth, as was proposed several years ago.

[Reply to S. BROWNING.]

Charing Cross, Euston and Hampstead Railway.

The throughout length of the Golders Green to Hendon and Edgware Extension is 4.72 miles. No part of this Extension has yet been constructed, but some of the land has been acquired.

[Reply to "YELVERTOVIAN."]

London and South Western Railway History.

There is no book now in print dealing with L. and S.W.R. history. There is a lengthy historical sketch concerning this line in the "Railway Year Book."

[Reply to C. L. B.]

4-Cylinder 4-6-0 Engines, Great Western Railway.

Piston-valves of these engines are actuated by two sets of Walschaert's valve-gear, arranged between the frames.

[Reply to T. HOLLOWAY.]

Track Water Pick-up Troughs.

Water is not "drawn" up out of the troughs, but by means of a movable scoop lowered from under the tender is forced up by the motion of the train with a considerable velocity, varying with the speed at which the train is running.

[Reply to T. HOLLOWAY.]

Midland Railway Apprentices.

Apprentices employed in the Midland Railway Locomotive Department, Derby, attend the Derby Municipal Technical College. There is no Midland Railway College, and so far as we are aware, never has been.

[Reply to E. ARDRON.]

Newport Pagnell Railway.

This line, 4 miles in length, was incorporated in 1863 with a capital of £60,000. It was opened 1867. It became vested in the London and North Western Railway on June 29th, 1875.

[Reply to B. GUNNERY.]

Conical Pistons.

A piston of conical form is adopted in the case of large cylinders, as it affords increased stability, without a corresponding increase in weight, as compared with a flat piston.

[Reply to R. WHEATLEY.]

Bournemouth.

No locomotives work into Bournemouth in the ordinary course other than those of the London and South Western and Somerset and Dorset Joint Railway Companies.

[Reply to W. G. T.]

Digitized by Google

Great Southern and Western Railway:

REBUILT LOCOMOTIVE CLASS 321. ENGINE No. 331.

ONE of the 4-4-0 type express passenger engines, with coned boiler, first put into service in 1904, has just been rebuilt with strengthened frame and other improvements at Inchicore Works, Dublin.

The original engines were designed to haul the heaviest main line express trains. Owing to the permanent-way restrictions at the time, the permissible load at the rail could not exceed 16 tons on a pair of wheels, but these conditions have since been improved. Engines with axle loads up to 19 tons have been running on the Great Southern and Western Railway for several years, and in arranging for the rebuilding of a Class 321 engine the opportunity has been taken of increasing the driving weight.

The boiler, motion, bogie, wheels, and general overall dimensions have not been altered. The cylinders have had a saddle extension added to support a projecting smoke-box of circular cross-section.

The principal improvement has been in the frame, the plates of which have been greatly deepened and altered in shape, the thickness being increased from 1 in. to 1⅛ in.

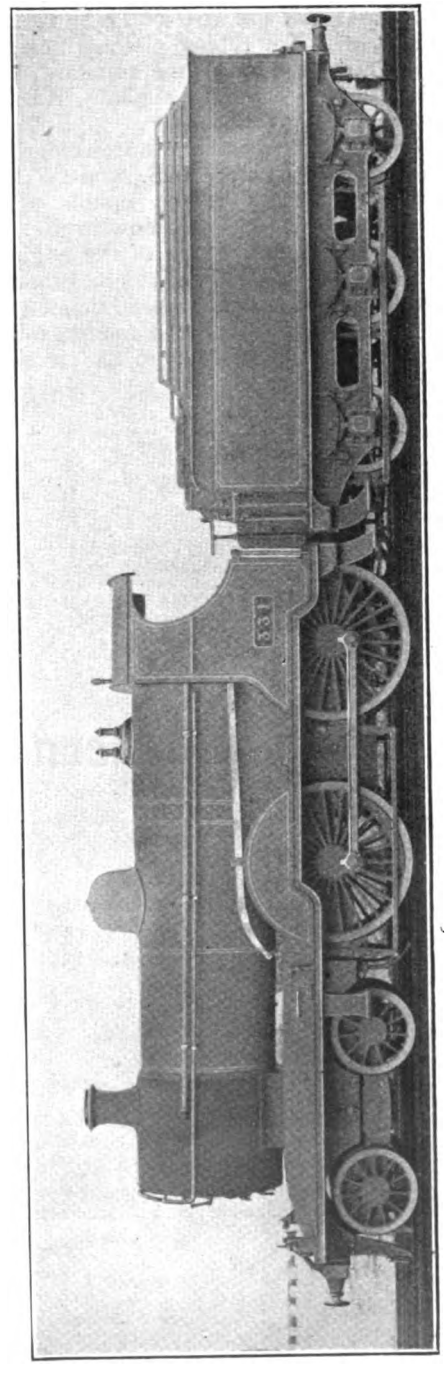
The platform has been altered to correspond with the recent practice of the company, leaving the central part of the coupled wheels exposed for freedom of examination from the outside.

A heavy cast-iron footblock has replaced the original built-up plate structure, and a strong cast steel frame stay has been substituted for the previous forging.

Apart from the additional strength imparted by these alterations, the effect on the driving weight will be seen from the subjoined comparative figures.

An interesting and unusual feature of the engine is the built-up crank axle, in which the eccentric sheaves form the main part of the central portion, having been cut from a solid steel forging.

The working pressure of the boiler has been increased from 160 to 170 lb. per



GREAT SOUTHERN AND WESTERN RAILWAY.
Rebuilt locomotive, class 321, engine No. 331.

Digitized by Google

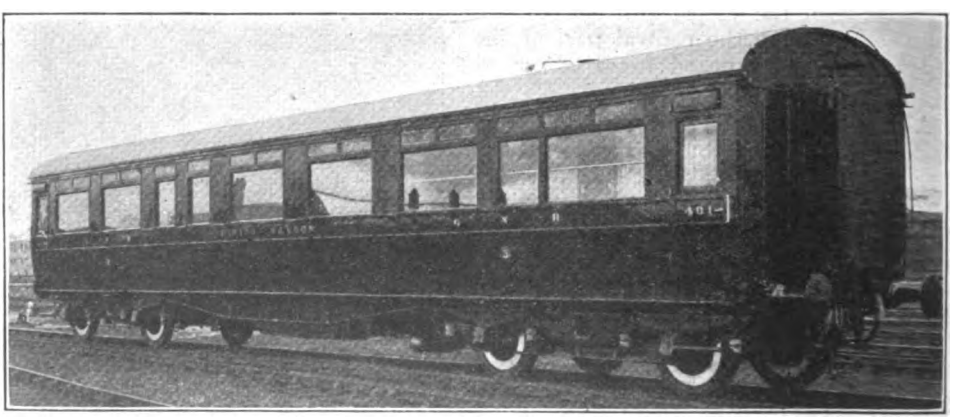
square inch, two 2½ in. Ross "Pop" safety valves replacing the original 3½ in. Ramsbottom columns.

The brake rigging has been left unaltered, with the exception of the vacuum cylinders. There are two of these 18 in. diameter, with flat rubber piston rings of the type now adopted as the standard, instead of the original shallow Hardy sacks.

A Dreadnought combination ejector instead of the former G.S. and W.R. arrangement suited to the double pipe brake system, which is not now in use.

The principal dimensions of the engine are as follows :—Cylinders, 18½ in. diameter, 26 in. stroke; bogie wheels, diameter, 3 ft. 6 in.; coupled wheels, diameter, 6 ft. 7 in.; working pressure, 170 lb. per sq. in.; wheelbase, rigid, 9 ft.; wheelbase, total, engine, 22 ft. 2 in.; wheelbase, total, engine and tender, 43 ft. 3 in.; total length over engine and tender buffers, 52 ft. 7⅜ in.; boiler barrel, length, 10 ft. 3¾ in.; boiler, diameter, inside, 5 ft. 0½ in.; firebox casing, length, 6 ft. 6½ in.; heating surface, firebox 145 sq. ft., tubes 1,283.9 sq. ft., total 1,428.9 sq. ft.; grate area, 23 sq. ft.; tubes, outside diameter 1⅝ in., No. 283. Weights — Original engine: Bogie, 18 tons 19 cwt.; driving, 15 tons 13 cwt.; trailing, 15 tons 9 cwt.; total, 50 tons 1 cwt. As rebuilt: Bogie, 19 tons 4 cwt.; driving, 17 tons 13 cwt.; trailing, 17 tons 8 cwt.; total, 54 tons 5 cwt. Weight of tender, 36½ tons; coal capacity, 7 tons; water capacity, 3,345 gals.

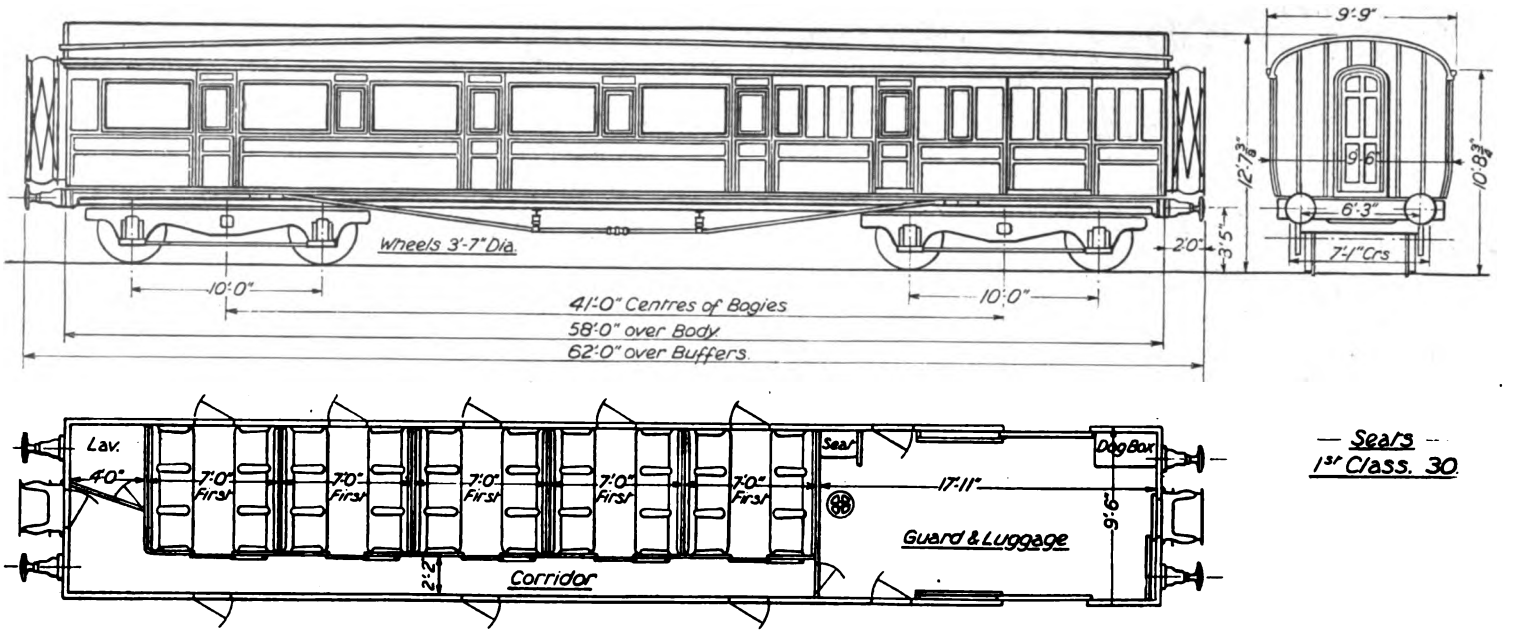
Great Northern Railway (Ireland).



NEW DINING CAR.

Digitized by Google

Great Northern Railway (Ireland): New Side Corridor Carriages.



FIRST CLASS AND BRAKE.

By the courtesy of Col. Geo. T. Glover, M.Inst.C.E., Locomotive Engineer, Great Northern Railway (Ireland), the RAILWAY MAGAZINE is able to publish this diagram illustrating the new side corridor vehicles that are being put into service on the company's system.

These vehicles are 58 ft. long by 9½ ft. wide, with elliptical roofs, and are carried on steel underframes, the latter being fitted with Spencer's double buffers. The bogies are of pressed steel, with 10 ft. wheelbase to the company's standard. The exterior of the carriage is finished in the natural colour of the mahogany and varnished.

It will be seen that the carriages are of the very latest type, being extra wide, *i.e.*, 9 ft. 6 in., having long wheelbase bogies. The vehicle illustrated weighs 32½ tons.

Digitized by Google

Baldwin Metre-Gauge Locomotive:

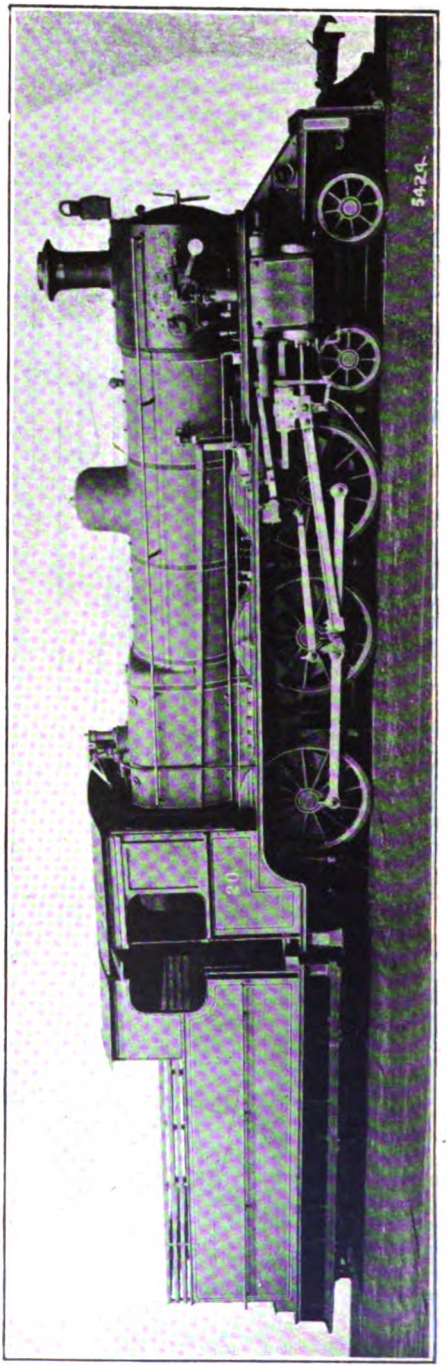
THE MORVI RAILWAY, INDIA.

THIS engine, although of relatively small size, is built on a thoroughly modern specification, having a superheater boiler, Walschaerts' gear with piston valves and the 4-6-0 wheel arrangement.

The cylinders, as seen, are placed on the outside of the frames with piston valves above them. They drive the middle pair of coupled wheels, and are fitted with single slide bars and the Laird type of crosshead. The boiler is equipped with a Belpaire firebox, upon which are mounted two Ramsbottom safety valves. The design is in accordance with British ideas throughout, including a copper interior firebox. It resembles very closely the Indian standard metre gauge engine of the same type, and is interchangeable therewith in respect of most of the details requiring renewal and usual repairs. Where this was immaterial American practice was followed, thus reducing manufacturing costs.

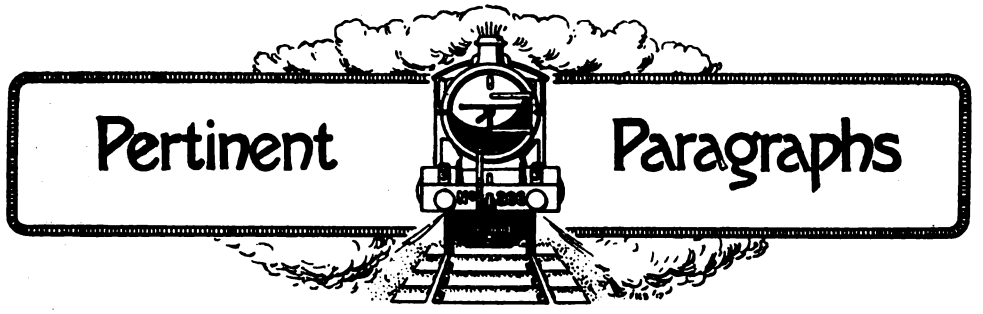
The following are the principal dimensions:—Cylinders, diameter, 15½ in.; piston stroke, 22 in.; coupled wheels, diameter, 4 ft. 9 in.; wheelbase, coupled 12 ft., engine 21 ft. 1½ in.; heating surface, firebox 93 sq. ft., tubes 707 sq. ft., total 800 sq. ft.; superheater surface, 199 sq. ft.; grate area, 13.6 sq. ft.; boiler pressure, 160 lb.; weight on coupled wheels, 26 tons 5 cwt.; total weight of engine, 34 tons 3 cwt.

The tender is of the six-wheeled pattern, with outside framing. It has a tank capacity of 2,400 gallons and a fuel space sufficient for 4 tons of coal. The tender weighs in working order 22¼ tons.



BALDWIN 4-6-0 TYPE ENGINE FOR THE MORVI RAILWAY, INDIA.

Digitized by Google



The Railway Service and the Victory.

BRITISH railwaymen of all ranks have reason to be proud of the part played by their great industry during the four years and four months between August 4th, 1914, and the signing of the armistice on November 11th, 1918. When hostilities began the railway service, like the Navy, was ready for any task that might be given to it, and whatever industry or department of State may have been found inefficient or lacking in preparedness for any eventuality, certainly the railways of the British Isles were proved beyond reproach.

Whole volumes might be written on the wartime activities of the British railway service. For the moment it is sufficient to recall the dispatch of the British Expeditionary Force; the prompt supply to the State of railway-owned steamers, and the use of docks owned and worked by railways. Then mention should be made of the use of the great locomotive and general railway workshops for the manufacture of the munitions of war and the building of ambulance trains.

Of the railway staff quite 25 per cent. entered war service, and a large number of railway officers were lent to the Government for administrative and military duties. Prominent among these were Sir Eric Geddes, Sir Albert Stanley, Sir Guy Calthrop, Bt., Sir Guy Granet, and Sir Sam Fay.

Fortunately the Government in taking over the control of railways had sufficient wisdom to leave the administration in the hands of capable railway officers. The work of Sir Herbert Walker, K.C.B., Acting Chairman of the Railway Executive Committee, will never lack appreciation. Truly, Sir John Aspinall in his Presidential address to the Institution of Civil Engineers was able to say: "The deadening effect of Government operation of industry has not been felt on the railways."

That the victory has been won by all sections of the community pulling together is an accepted fact. There is to-day a much better understanding between employers and the employed, and the railway service is no exception to the rule. As a case in point, the London, Brighton and South Coast Railway may be cited.

The Earl of Bessborough, K.P., the Chairman of the London, Brighton and South Coast Railway, on receipt of the news that the armistice conditions had been signed by the Germans, called all the available railway staff together in the company's general meeting room. His Lordship said: "We have on several occasions met together here in August to commemorate our entry into the war, and on these occasions we always held in remembrance those of our colleagues who have fallen in the war, and also those of our colleagues who have given their bodies to be mutilated and who are now seen in the streets of London armless and legless. Neither those who have fallen nor those who are wounded will be forgotten in this our great day of joy, when the infernal machine fashioned by the enemy has broken down and come to grief. I am sure it is unnecessary to say that we as Englishmen have kept our heads and nerves together during the war, and we will continue to do so now that this awful thing has passed and gone. You will forgive me if I do not say any more. We quite understand each other."

Railways in the Armistice Terms.

MOST RAILWAY MAGAZINE readers will have noted the references in the armistice terms to railways, which have played so important a part in the great war, and which will have vast work in the demobilisation operations at home and abroad, in the return of prisoners, the repatriation of men, women, and children forced from their homes, and the transport of supplies and provisions.

Clause VII. provides that "roads and means of communication of every kind, railroads, waterways, main roads, bridges, telegraphs, telephones shall be in no manner impaired. All civil and military personnel at present employed on them shall remain. Five thousand locomotives, 150,000 wagons, and 5,000 motor lorries, in good working order, with all necessary spare parts and fittings, shall be delivered to the Associated Powers within the period fixed for the evacuation of Belgium and Luxemburg. The railways of Alsace-Lorraine shall be handed over within the same period, together with all pre-war personnel and material. Further material

Digitized by Google

necessary for the working of railways in the country on the left bank of the Rhine shall be left in situ. All stores of coal and material for upkeep of permanent way, signals, and repair shops shall be left in situ, and kept in an efficient state by Germany, as far as the means of communication are concerned, during the whole period of the armistice."

Gravity Tube Railways.

Apropos of remarks in the November RAILWAY MAGAZINE our contributor, Mr. R. W. A. Salter, writes:—

"Mr. Chalmers Kearney's paper read before members of the Railway Club and referred to in the last issue of the RAILWAY MAGAZINE serves only to emphasise the *sine qua non* for enlarging the facilities for the rapid transit of passengers in London and for converting them to such as will enable workers of every class to live under healthy conditions in the outlying districts. Our metropolis may jog along haphazard fashion with existing methods, but it swiftly tends to fall behind at least one city which aims to rival it in size and commercial importance.

"'The New York Subway,' Mr. Kearney pointed out during the course of his lecture, 'is the only underground railway in the world which earns a return on the investment of more than 3 per cent. The conditions of location and service in New York have no parallel in any other city, and it is only under such conditions of congestion that a subway on the existing system can hope for an adequate return.' In the case of London the underground railways have hardly proved a financial success. Unfortunately they were built on an unnecessarily expensive plan, and as isolated fragments running independently for their own advantage. The adoption of lifts and escalators, the maintenance of which consume a very large proportion of operating expenses, has throttled their potential traffic. For the most part they were conceived in the last century, and it is unthinkable, therefore, that a point of finality can yet have been reached. The cruel fact is that Mr. Kearney has come at a late hour with his proposals, but there is not the slightest reason why they should not be adopted on new railways.

"If I may quote the words of a prominent official of the Underground group, given to me personally during an interview, and published in the *Railway Gazette* of November 24th, 1916, 'the scheme contemplating a deep-level District Railway, for the purpose of relieving the intense traffic experienced on the Metropolitan District Railway during the rush hours, has not been abandoned altogether, and this problem will come up for examination as soon as there is a prospect of work of this character being undertaken.' Although this tube railway would doubtless do much to relieve the District Railway under the stress of rush-hour traffic, I have always considered it highly improbable that a deep-level railway of the kind intended would bestow the greatest advantage upon the public. It would not shorten the time occupied in travelling to any really appreciable extent, while the heavy costs involved by construction and maintenance would disenable the company to reduce its fares for many years to come. If a proposal is in hand for duplicating the District Railway, why cannot the opportunity be utilised to best advantage and the line placed where it will be most easily accessible to the vast majority of the public? A railway paralleling the District along, say, Pall Mall, Strand, Fleet Street, Ludgate Hill, Cheapside, Bank, and Leadenhall Street, and with a loop to the Great Eastern terminus, for the most part would be directly in the stream of travel which now finds its way to the District. If it cannot be constructed on the shallow cut-and-cover principle, like the latter, for fear of disturbing street traffic and of having to relocate a complicated network of sewers and pipes, there is always recourse to be had to the Kearney system, which avoids interference with surface and sub-surface utilities except in some minor cases at stations! The present District lines could be used for the fast through trains and the Kearney tube for the locals. Another deep-level tube on the plan of the existing ones, with all the attendant inconveniences of lifts, etc., to say nothing of the expense borne by the public in the matter of high fares, is undesirable."

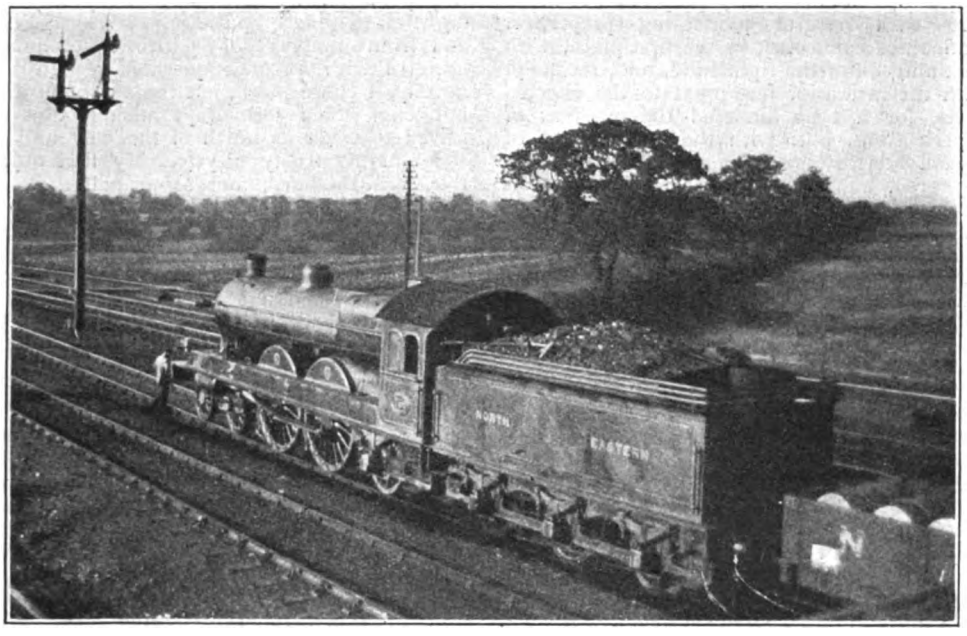
In conclusion, Mr. Salter adds:—

"I understand that the City and South London Railway is to be entirely reconstructed after the war. This would seem to present another favourable occasion for installing the Kearney gravity tube, which, I think, holds great possibilities for improving the conditions in London, particularly as economical methods will be essential in the future if we are to carry the load of our war debt successfully."

Compound "Atlantics" on the North Eastern Railway.

WAR-TIME has produced some strange anomalies in railway operation, and not the least of them has been the extensive employment of passenger engines on goods service. On the North Eastern Railway this condition of affairs obtained largely before the war, the level character of the line from Doncaster through to Darlington inviting the employment of large-wheeled locomotives on fast goods trains, and the needs of the war have simply intensified the practice. The annexed illustration shows No. 730, one of Mr. Wilson Worsdell's two 4-cylinder compound engines on the Smith system, waiting on a goods train in the reception road at Alne, 11 miles north of York, for

Digitized by Google



Photo] [*Norman North-Smith.*

NORTH EASTERN RAILWAY.

Goods train waiting at Alne for down Scotch express to pass.
Engine: 4-cylinder compound superheater 4-4-2, No. 730.

the 6.25 p.m. express from York to Newcastle to pass. Both No. 730 and No. 731 are now superheated, and perform work fully equal to that of the 3-cylinder simple "Atlantics," even though the former engines are now 13 years old. As regards the weight of the train behind No. 730, it is customary to let the "Atlantics" take no less than 80 wagons and a brake over this stretch, with a total weight of 1,000 to 1,200 tons behind the tender, the large mineral engines being allowed 90 wagons. But, as is well known, as far as Darlington there is barely a grade worth mentioning.

Some Eccentricities of "Bradshaw."

A WELL-KNOWN correspondent calls our attention to the note "p" on pages 150-153 of Bradshaw's Guide, which intimates that by certain L.B.S.C.R. down trains from Victoria (which have connections from London Bridge calling at Norwood Junction) passengers are not conveyed from Victoria or Clapham Junction to Norwood Junction. To anyone having the remotest acquaintance with the geography of that locality the meaningless character of the note is obvious, seeing that the Victoria trains do not pass within some miles of Norwood Junction. But it seems to us that all need of such a note would be dispensed with altogether if the line at present shown under Victoria in this table were removed, and the line under London Bridge were lowered so as to include New Cross and Norwood Junction. It would thus become clearly apparent that Victoria and Clapham Junction constituted one route out to Croydon, and London Bridge, New Cross, and Norwood Junction the other. Another curiosity is the description of the main station at Aldershot as "Aldershot" simply in the L. and S.W. tables, and as "Aldershot Town (South Camp)" in the S.E. and C. London-Red Hill-Reading tables, which might easily lead the unwary to suppose that two different stations are referred to. In reality the stations are one and the same; the same platforms are used by the two companies, and several of the trains are arranged to connect.

Locomotive Lubrication.

THOSE who in studying locomotive practice have closely followed the various stages of evolution during recent years will have realised the highly important gain that has been effected by the general adoption of superheating. Superheated steam at high temperatures is akin in a measure to gas, the use of which tends to increase friction between moving surfaces in contact with one another. This means, in other words, that the lubrication of the cylinders and pistons becomes an even more vital matter than it was in the days when locomotives were universally operated by saturated steam, which latter, as the word

Digitized by Google

indicates, contains a large proportion of moisture with natural lubricating properties. Difficulties connected, in the first place, with obtaining oil of the right kind, and, secondly, with the means of feeding it to the affected parts, for a time hindered the progress of superheating, but, with the introduction of special lubricating devices this difficulty disappeared, and the mechanical lubricator has taken its place as an essential part of the standard equipment of the majority of superheated locomotives. The Wakefield Mechanical Lubricator, which has taken a leading part in making the highly superheated locomotive practicable of use, is nowadays a familiar object on most of the railways in this country. It is employed not only for lubricating the cylinders and valves, but also for feeding oil under pressure to the axleboxes, and in this last respect alone it is every day saving hours of enforced idleness on the part of engines which would otherwise be obliged to "lay off" owing to "hot boxes." The RAILWAY MAGAZINE has many opportunities of discussing these matters with locomotive engineers and drivers, and is accustomed to find the Wakefield lubricator held in the highest possible esteem. Its popularity has been further enhanced more recently by the introduction of what is known as the "Anti-Carbonising Device," by means of which the incrustating effect of oil delivered to heated surfaces, such as the cylinder walls, steam chest liners, and valves when the engine is running with steam shut off, is avoided. This is a very important addition to the lubricator itself, and, indeed, has done a very great deal to increase the popularity of the Wakefield lubricator amongst practical locomotive men. As a factor in the development of the present-day locomotive the Wakefield lubricator has unquestionably assumed a very prominent rôle.

By Road and Rail.

FOR more years than I care to count (writes Mr. E. P. Rowland) I have taken keen interest in railways and cycling. I have covered on my machine, of the modest "push" variety, most of the chief roads in half a score counties in the Midlands, West of England, and Wales. By judiciously alternating between turnpike and rail, saddle and comfortable seat in a railway carriage, it is possible to accomplish in a day quite respectable journeys. Moreover, to one who finds interest in railway matters—and it is amazing how great a company they are—on a long cycle ride, especially if it be of a cross-country nature, there is usually plenty to satisfy his desire, for, with rare exceptions, road and rail are never very far out of touch in this crowded land of ours. This fact, by the way, adds no little to the peace and security of the vagrant cyclist.

On a summer morning this year I left my home in a village in Warwickshire, near Rugby of railway fame, to find my way ere nightfall to a place on the South Wales coast; and from motives of patriotic economy, mingled with an unconquerable desire for novelty, I chose—well, not the shortest route, but one which seemed promising, and resolved to cover as much of the way as possible on my trusty bicycle. My first objective was Banbury, and some half a dozen miles on my way thither the road crossed, first, a canal bridge, under which passed, chugging quietly along, a motor-barge, which, I gathered from its gaudily painted sides, performed a regular service between London and Birmingham. Then close by appeared my first railway, a branch of the L. and N.W. from Weedon and Daventry which joins the Rugby Leamington branch a few miles from the latter town. This line serves the cement works whose tall chimneys and yawning quarries seem somewhat out of place in rural Warwickshire. Passing through Southam, whose people doubtless deplore the long distance they are from the various railways which encircle them, after a few miles pleasant riding I again crossed a canal and railway in close contiguity. The railway I discovered to be the G.W. main line Paddington to Birmingham and the North, and alongside it ran the single road of the Stratford-on-Avon and Midland Junction, the railway of disappointed hopes, as its former name of East and West Junction Railway seems to suggest. There were no signs of life on it as I passed, but along its big neighbour a heavy goods train, hauled by an engine of large type, thundered by on its way to the same centre of activity as the puffing barge of a few miles back. The station of which I caught a glimpse a little way off was Fenny Compton, served by both companies. A group of soldiers working a steam hay baling tackle on the roadside and loading up their wagons for conveyance to wharfside or station yards, and thence where?—and also some German prisoners passing by in a farm cart—reminded one that there is no escaping the signs of war wherever one goes; and I learned, too, that even in war-time some railway constructional work goes on, for before reaching Banbury a sign warned me of a level crossing ahead, which an unfinished railway arch spanning the road showed to be of temporary construction for the accommodation of the contractor's lines.

This line I found to be the North Oxfordshire Ironstone Railway; doubtless here was a sign of the times, an illustration of one of the happier results of war—viz., the compelling us to make larger use of our own home resources. Banbury is, of course, a well-known railway centre served by G.W., G.C., S.M.R., but I was not tempted to linger on that account. Passing by the famous Cross, which, though I saw that morning for the first time, I seemed to have known all my days, pointed out by an aged

Digitized by Google

road-sweeper the "Narton" road, I duly proceeded thither. Three miles on the way to Chipping Norton I crossed at Bloxham Station, from which a neat little auto-train was just leaving, a G.W. branch from Banbury to Cheltenham. Here I reflected for once the bicycle has scored, for to arrive at Bloxham the motor train has had to journey eight and a half miles, calling at two stations, and probably left Banbury not later than I did.

Along this branch line, which winds prettily in and out amongst the Oxfordshire hills, and which I was destined to see again on my journey, the famous long-distance express trains from Barry to Newcastle-on-Tyne used in pre-war days to pass, for it forms the essential link between the trunk lines of the G.W. and G.C. In the old-world town of Chipping Norton—very quiet and peaceful now, but busy enough in the days when the "Road" was man's speediest way of journeying—sign-posts "To the G.W. Station," "To Kingham," reminded me I drew near to another of the main lines of the G.W., the Oxford and Worcester; but I left Kingham on my right, and bade farewell to the Banbury and Cheltenham. After a delightful ride through the beech woods with which this district seems to abound, and in some of which women foresters were hard at work, and after a race down a sharp descent into a broad valley, with the promise of a still climb beyond, I crossed this line at Shipton Station. Burford was my next point, and pretty hard it seemed getting there in the mid-day heat. The road passes quite close to a group of the enormously high masts of a wireless telegraph station, which one had often noticed with curiosity from the trains on the Oxford line, and one wondered as one drew near to these strange appliances of modern science what news from the Western Front and from more distant fields was being picked up by them. Burford, with its beautiful old church and quaint old houses, is well worth a visit, but a bicycle or conveyance of some sort is desirable, for the iron road comes not nearer to it than Shipton. Before I reached my next town another line unexpectedly came into sight, and a signal-post, the fencing, whole *format*, and a distant engine whistle proclaimed unmistakably G.W. property again. This turned out to be the Oxford, Witney, and Fairford branch, and the station was Lechlade, though some little distance from the town, the next to the terminus. Crossing the youthful Thames there by one of the first of its many famous bridges—that which marks the commencement of its navigation—I made my way to Highworth, where yet another branch of the ubiquitous G.W. came into evidence.

As later I passed over this line with the chimneys of Swindon in view, I fell in with another wayfarer, who informed me the branch had the distinguished honour of being the scene of the first labours of the railwayman M.P. and Privy Councillor, Mr. J. H. Thomas, for whose sound judgment and sturdy common-sense we both expressed admiration. There is, of course, no mistaking the fact that Swindon is at the very heart of railway life, and that the whole place spells just three letters—"G.W.R."; but on my way to the station I caught sight of another railway, one which pursues just such a course as I had been all day following—straight across country, north to south—viz., the Midland and South Western Junction, a line which always seems to me at this point somewhat of an interloper, creeping, as if ashamed of itself, round the yards and multitudinous sidings of its big sister, who wants to have nothing to do with it. Swindon is a place where a "Railwayac" (an ugly, but expressive, word that!) would linger longer, but only a few minutes were left me to wait for my train. One thing I did notice—an engine shunting near by in spite of its green livery seemed to be of the build which one was accustomed to see on the South Wales lines and docks, and presently, as it passed through the station, sure enough I read on its number plate "Port Talbot Docks and Railways," a concern in which now, I believe, the G.W. has a controlling interest. A welcome cup of tea, and I was seated in a smooth-running carriage which, after 65 miles in the saddle, seemed even easier travelling than usual, and in less than a couple of hours Cardiff, my destination, was reached. No, not quite that, for there were yet a few miles left to cover to the abode of my friends, and more than once I came into contact with the busy lines of the Taff Vale and Barry Companies. As I breasted an eminence and saw stretched below me miles upon miles of crowded storage and dockside sidings, I contrasted the busy outlook with the peaceful, pastoral, and woodland scenes, the sleepy old towns eloquent of past glories and decayed industries, and the quiet wayside stations I had passed during the day.

Digitized by Google

SIR JOHN A. F. ASPINALL, who has been General Manager of the Lancashire and Yorkshire Railway since 1899, delivered his Presidential address at the Institution of Civil Engineers on November 5th. To be at the same time President of the Institution of Civil Engineers and General Manager of a leading British railway is a rare distinction, but it is not absolutely unique even within recent years, because it also fell to Sir James C. Inglis in 1908, whilst he was General Manager of the Great Western Railway. Sir John Aspinall enjoys the distinction of being the only General Manager of a British railway who has succeeded to the position of Chief Executive Officer from that of Chief Mechanical Engineer. He is also a past President of the Institution of Mechanical Engineers, and is the first General Manager to be elected President of these two great engineering societies during his term of office on a railway. He received the honour of knighthood in 1917 on the occasion of the King's Brithday.

* * *

SIR JOHN A. F. ASPINALL,
General Manager,
Lancashire and Yorkshire Railway,
President of the Institution of
Civil Engineers, 1918-19.

BEFORE proceeding with the business at the last meeting of the Irish Railway Clearing House Managers' Conference, Mr. J. Coghlan, General Manager of the Dublin and South Eastern Railway, in the chair, a resolution was unanimously adopted expressive of the great regret with which the Conference had learned of "the tragic and untimely deaths of Mr. Arthur Adshead and Mr. S. J. Cocks, who lost their lives at sea owing to enemy action. Both Mr. Adshead and Mr. Cocks were honoured and respected members of the Conference, and the meeting desired to express its sincere sympathy with their relations."

* * *

WE much regret to record the passing away, at the age of 78, at his home, Grove Lodge, Clapham Park, S.W., of Mr. Victor Gerard, for many years Continental Traffic Manager of the London, Brighton and South Coast Railway, and formerly well known in Anglo-French and Italian railway and commercial circles. Mr. Gerard entered the service of the Brighton Company in 1861; he was appointed Chief Clerk of the Newhaven office in 1862, and of the head office in London for Continental traffic in 1864, being appointed Continental Traffic Manager in 1874, an office he held until December, 1898, when he retired on account of ill-health. He was instrumental in introducing to England the Italian produce traffic, and was knighted by the Italian Government for his services in that direction. Later on he was made a knight of the French Legion of Honour. Mr. Gerard was much respected in a wide circle of railway officials and others on both sides of the Channel, and his death will be learned with regret.

* * *

MR. GEO. M. BOSWORTH, Chairman of the Canadian Pacific Ocean Services, Ltd., announces the appointment of Mr. C. E. Benjamin as Passenger Traffic Manager in full charge of Passenger Services on the Atlantic and Pacific Oceans, with headquarters at Montreal.

Digitized by Google

MR. GEORGE ROBINSON, who retired on November 1st on superannuation from the position of Superintendent of the Police, London and South Western Railway, is succeeded by Mr. Robert Duckworth, head of the Detective Department of the Liverpool Police.

* * *

MR. ELIAS FORD, who has been appointed Assistant Goods Manager of the Great Western Railway, entered the service in 1884 in the office of the Plymouth Divisional Superintendent. He was transferred to

MR. E. FORD,
Appointed Assistant Goods Manager, Great Western Railway.

Paddington in 1890 for special duties in connection with the conversion from broad to narrow gauge in the West of England, which work, it will be remembered, was carried out in May, 1892. He then served in the office of the Chief Goods Manager, and in 1895 he was transferred to the General Manager's Office, becoming, two or three years after, responsible for the new works section of that department. Later, he was employed in Parliamentary work, which at that time was a much more important section of the General Manager's Department of a British railway than it has been during the past decade. At that time also he assisted Mr. T. H. Rendell, the present General Manager of the Barry Railway, in an important arbitration case with the Rhymney Railway, and in connection therewith spent some considerable time in the South Wales district, where he acquired a thorough knowledge of the intricacies of railway working in that area. In 1905 he was appointed Chief Clerk to the Worcester District Goods Manager, and 16 months later was moved to Cardiff in a similar capacity. In 1912 he became Assistant at Cardiff, and on January 1st, 1915, took over the position of Cardiff District Goods Manager, which he vacates to take up his new position at Paddington. In collaboration with the late Mr. A. R. Burnell, of the Audit Accountant's Department, Mr. Ford produced an elaborate handbook, illustrated with over 200 specially drawn plans and diagrams of all the Great Western Railway running powers. Mr. Ford later compiled a complete index to all the private Acts in any way affecting the Great Western, and in 1913 wrote a paper on the "Management of a First Class Goods Station," which had a wide circulation amongst the Great Western staff. Mr. Ford has always evinced an interest in the education of the railway staff, and as the result of his efforts this session large classes for railway officials and clerks have been formed at Cardiff and Newport in connection with the technical colleges in those towns, at which lectures on railway law, railway economics and kindred subjects, railway operation and railway station accountancy are being given.

* * *

MR. JAMES CARTER, who has been appointed Divisional Superintendent of the Great Western Railway at Swansea, which post was rendered vacant by the death of

MR. J. CARTER.
Appointed Divisional Superintendent, Swansea, Great Western Railway.

Mr. John Rees, commenced his railway career in the Goods Department at Gloucester in 1873. He was engaged in

Digitized by Google

various departments in the District Goods Manager's Office, eventually taking charge of the Rates Department. In 1879 he was transferred to the Staff Department of the General Manager's Office. In 1881 he was removed to the Divisional Superintendent's Office at Swansea, and after acquiring a knowledge of the several departments therein, and of station work, was appointed Chief Staff Clerk. In 1895 he was transferred to Carmarthen as Stationmaster, and three years later was appointed Chief Clerk to the Divisional Superintendent at Pontypool Road. In 1903 he was removed to Cardiff to fill a similar position. In 1910 he was appointed Assistant Divisional Superintendent at Cardiff, and a year later was transferred to Worcester as Divisional Superintendent.

* * *

MR. ALFRED BROOK, who has been appointed Divisional Superintendent for the Worcester Division, Great Western Railway, entered that company's service at Plymouth

MR. A. BROOK,
Appointed Divisional Superintendent, Worcester, Great Western Railway.

in 1878. After obtaining station experience he was removed to the Divisional Superintendent's Office, and subsequently was transferred to the office of the Superintendent of the Line at Paddington as a member of the outdoor train running staff. In 1907 he was appointed Chief Clerk to the Birmingham Divisional Superintendent. This transfer took place at a time when the Birmingham Division was being transformed by the quadrupling of the main lines north and south of Snow Hill Station, the provision of numerous relief lines and running loops and the general reconstruction of Snow Hill Station, accompanied by the provision of a new station at Moor Street. Another important new work affecting the operation of the Birmingham Division was the opening of the North Warwickshire line giving the Great Western shorter access between Birmingham and the West of England and South Wales, whilst the opening of the Great Western's new route between Birmingham and London via Bicester naturally involved a complete reorganisation of the passenger and goods services between South Staffordshire and the Metropolis. In 1916 Mr. Brook was appointed Assistant Divisional Superintendent at Birmingham.

* * *

AT a meeting of the Old Petriburgians' Association, held at the King's School, Peterborough, to consider proposals for a memorial to the Old Boys who have fallen in the war, Mr. Alfred Aslett, J.P., the recently retired General Manager of the Furness Railway, generously offered to bear the cost of a brass memorial tablet, to be placed in the Cathedral, subject to the consent of the Dean and Chapter.

* * *

MR. M. S. STRANG, at present District Superintendent at Glasgow, North British Railway, has been appointed by the directors to be Commercial Superintendent, with headquarters at Edinburgh, in succession to the late Mr. William Strang. Prior to going to

Photo] [*Lafayette.*
MR. M. S. STRANG,
Appointed Commercial Superintendent, North British Railway.

Digitized by Google

Glasgow as District Superintendent on January 28th, 1918, Mr. M. S. Strang was Acting District Superintendent at Burntisland as from April 23rd, 1917. Previously he was Traffic Control Master at Coatbridge, being the first to receive such an appointment on a Scottish railway. Prior to Mr. Strang's appointment as Control Master at Coatbridge he was the Chief Assistant to the District Traffic Superintendent of the Monkland section, and previous to that he occupied the position of Agent at Inverkeithing and Perth.

* * *

MR. JOHN ELLIS, Chief Assistant to the District Traffic Superintendent at Edinburgh, North British Railway, has been appointed to succeed Mr. M. S. Strang as District Traffic Superintendent at Glasgow. Mr. Ellis began his railway career at Burntisland some 35 years ago, and after holding various

Photo] [*Lafayette.*

MR. JOHN ELLIS,
Appointed District Traffic Superintendent at Glasgow, North British Railway.

positions in the west, including Greenock and Craigendoran, he was appointed Stationmaster at Queen Street, Glasgow, on the death of Mr. Gilmour in 1914. He occupied that position until his promotion on January 28th, 1918, to be Chief Assistant to the District Superintendent at Edinburgh.

* * *

MR. ALEXANDER CLARK, Clerk to Aberdeen District Committee, reported to a recent meeting that the question of light railways in Aberdeenshire had been under consideration of the Rural Transport Board, and in certain cases the proposals had been very favourably received. No better claim, for instance, it was stated, had been placed before the board than that a light railway from Aberdeen to Skene and Echt, possibly connecting with Strathdon at Castle Newe. The only difficulty seemed to be as to getting the railway into the city of Aberdeen, and here there were two proposals—one that passenger traffic might connect with the Corporation tramway system, and another that goods traffic might connect with the Great North of Scotland Railway system at Culter Station. The Aberdeen and Newburgh light railway had also received careful consideration.

* * *

IN the House of Commons, Captain Sheehan asked the President of the Board of Trade whether he was aware that the junction recently made between the Cork and Macroom Railway and the Cork and Bandon Railway at Cork was only allowed to be used for military purposes and that general public traffic was not allowed to pass over it, with the result that cattle forwarded from the Macroom line had to be unloaded at Cork and driven through the city, and coal and other sea-borne goods had to be carted to the terminus of the Macroom line at Cork instead of being loaded into railway wagons on the quays; whether application had been made to the Executive Committee of the Irish railways to permit general public traffic to be sent over the junction; and if so why the application had not been granted. Sir A. Stanley, in reply, said: The junction referred to was constructed at the expense of the Admiralty for the conveyance of naval and military traffic only, and the Board of Trade have no power to intervene. I may however say that I understand that the line could not be made available for general traffic unless considerable further expenditure were incurred on its equipment.

* * * *

SINCE Friday, November 1st, the West Croydon and Wimbledon branch line of the London, Brighton and South Coast Railway has been worked by motor trains calling at Merton Park, Morden, Mitcham, Mitcham Junction and Beddington Lane. The existing train times, both weekdays and Sundays, will remain in operation, excepting that the 11.55 a.m. (weekdays) Wimbledon to West Croydon, will leave at 11.35 a.m. and run 20 minutes earlier throughout. In consequence of this arrangement, Morden Station has been re-opened as a motor halt for the convenience of passengers only on weekdays and Sundays. Beddington Lane and Merton Park stations are also being used as motor halts for passengers only. No parcels traffic or any other business is dealt with at these three halts.

Digitized by Google

In November the Caledonian Railway began a number of alterations in its passenger train services. The changes include the withdrawal of certain important trains and in other cases alteration of the hours of departure, and in view of the extent of the new arrangements intending passengers are advised to consult the official time-tables. Among the trains discontinued are the 5.30 p.m. Glasgow (Buchanan Street) to Stirling, the 9.32 p.m. Perth to Glasgow, the 7.25 a.m. Glasgow (Central) to Wemyss Bay, the 1.25 and 4.35 p.m. Glasgow to Gourock, the 9.40 a.m. and 7.40 p.m. Wemyss Bay to Glasgow, and the 3.5 p.m. Gourock to Glasgow. On the Cathcart Circle Railway a number of trains have been withdrawn between the hours of 10 a.m. and 12 noon, 2 and 4 p.m., and 7 and 10 p.m. Alterations have been made also on the Glasgow (Central) Underground and the Clydebank, Dumbarton, and Balloch and other local services.

* * * *

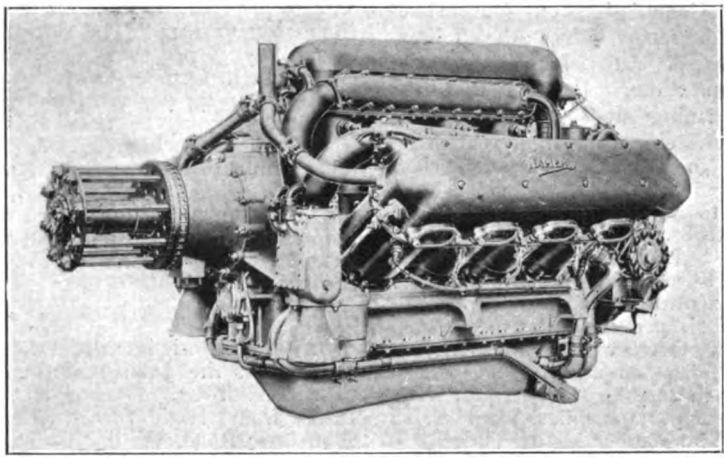
At the Railway Club, 92, Victoria Street, S.W.1, the monthly general meeting of members is now held at 7 p.m. on the first Tuesday each month. At the November gathering, Mr. W. Parker presided. In the absence of Mr. A. W. Bartlett, through illness, his paper, "London Suburban Train Services before and after the War," was read by Mr. H. L. Hopwood. The paper provided the material for an interesting debate. On Tuesday, December 3rd, Mr. M. D. Greville is to present his thesis entitled "The Individuality of British Railways." Arrangements have been made for Railway Club members and friends to visit on Saturday, December 7th, the Kearney High Speed Railway Works, Battersea. The meeting place will be Lavender Hill, opposite Ascension Church, and the time 3.15 p.m. Any Railway Magazine readers who can accompany the party will be welcomed.

* * *

At the first meeting of the fourth series of Operating Department Efficiency Meetings in connection with the London Underground Railways, held at the L.G.O.C. Training School, Milman's Street, Chelsea, Mr. H. E. Blain, Operating Manager, presided over an attendance of about 250 administrative and control staffs. A cinema lecture entitled "Some Topical Camera Production, in connection with the Underground Railways and L.G.O.C." was given by Capt. A. Rozier, Superintendent of Employment and Training, L.G.O.C. He had gathered together some exceedingly interesting illustrations both on past transit facilities and on present developments in the London area. The films and slides shown included an excellent new film of a trip on the District Railway showing some fine pictures of the Lots Road Power Station, and a series of slides on road locomotives, showing types of vehicles from 1770 to the present date, which pictured graphically the evolution of traction and its application to passenger and goods transport. Other topics illustrated were the conversion of a 'bus

LONDON AND SOUTH WESTERN RAILWAY VAN HORSE, NO. 2667.
Winner of the Heavy Trade Turn-out first prize at the Aldershot Command Horse Show, 1918.

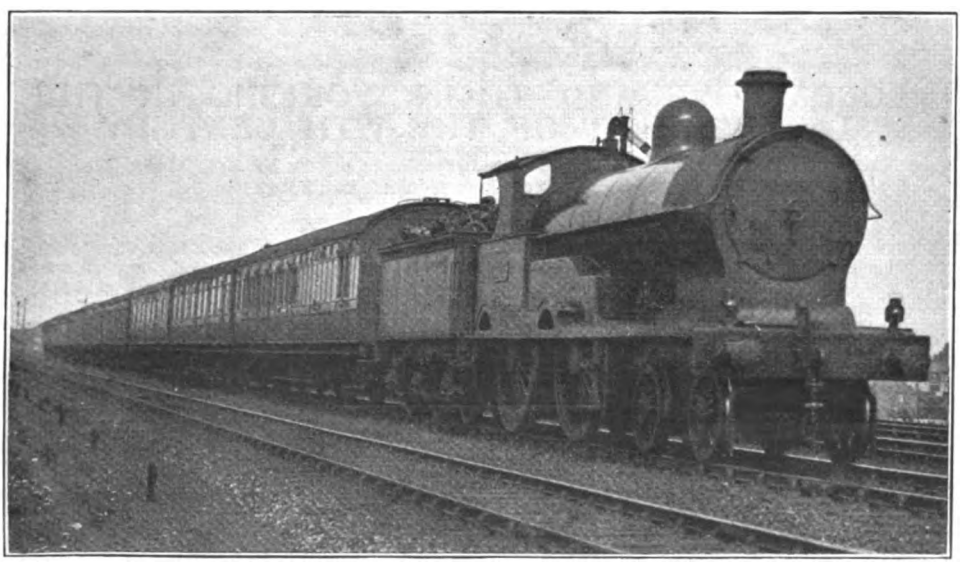
Digitized by Google



450 H.P. NAPIER "LION" AERO ENGINE.

In the establishment of British supremacy in the air the Napier engines for aeroplanes have taken a leading part.

from petrol to gas fuel, and an instructive series showing the latest developments in the training of 'bus employees in First Aid to the Injured, the slides showing improvised splints and bandages which can be made up from the tools and equipment carried on a 'bus. The variety of the evening was added to by films showing an inspection of the Underground Railways and L.G.O.C. contingent which took part in the Women's Procession of Homage to the King and Queen, and of a visit of the King and Queen to the Walthamstow works of the Associated Equipment Co. Although the lecture was of a popular, as distinct from the technical type, it was keenly enjoyed by those present, whose interest was stimulated by the diversity of the interests of the companies they serve.



Photo] [*Chas. S. Lake.*

LONDON AND NORTH WESTERN RAILWAY.

Up Manchester-London express.
4-4-0 superheated engine, *Partridge*.
Train photographed immediately south of Bletchley.

Digitized by Google

THE Royal Commission on Queensland Railways in its report gives the following particulars of rates for haulage in that Australian State. It says that the lowest rates ruling in Queensland since the year 1897 were from the year 1907 to 1914. For 50 miles of carriage, class M goods have been increased since then from 4s. 7d. to 4s. 10d. per ton; class A, from 7s. 6d. to 8s. 1d.; class B, from 13s. to 14s. 2d.; 1st, from 21s. 8d. to 23s. 4d.; 2nd, from 30s. to 32s. 6d.; 3rd, from 41s. 8d. to 44s. 2d.; agricultural produce, from 7s. 6d. to 8s. 1d. Wool, per 100 miles, from 40s. to 43s. (and in October last to 47s. 3d.). Wool, dumped, per 100 miles, from 50s. to 53s. 9d. (and in October last to 59s. 1d.). Cattle, per head per 100 miles, from 5s. to 6s. 7.18d. (and in October last to 7s. 3.05d.). Sheep, per head per 100 miles, from 6.46d. to 8.15d. (and in October last to 8.896d.). It will be seen from these figures that the increase on goods rates from their lowest points has not exceeded 8 per cent. with the exception of live stock and wool. Wool was increased only 7½ per cent. until October last, and the increase then made amounted to only 18 per cent. increase on the rates ruling from 1907 to 1914. The cattle rate was increased by 32 per cent. in December, 1916, and again in October, 1917, to a rate which amounted to 45 per cent. above that ruling in 1914. It may be noted here that the freight on cattle in 1902 was 20s. per 500 miles; in 1916-17 it was 21s., and increased to 23s. 1.2d. in October, 1917. Comparing the prices then ruling for cattle with the present prices, the cattle-freighter to-day pays a much less proportion of the value of his product for freight.

* * *

OF quite historic interest is the fact that this year marks the Jubilee of the Metropolitan District Railway. Opened on October 1st, 1868, from High Street, Kensington, to Gloucester Road, the line on December 24th, 1868, was extended from Gloucester Road to Westminster. The first experiments in the electrification of the system were made in May, 1900, with an electric train which ran between Earl's Court and High Street. On November 5th, 1905, all steam trains on the District Railway were withdrawn and electric working became universal.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—

L. & N.W.: Jan., Feb., March, May, 1915. (All out of print except May.)
Great Northern: June, July, 1915. (Out of print.)
M. S. & L.: Aug., Sept., Oct., 1915. (Aug. out of print.)
Great Western: Nov., Dec., 1915. (Dec. out of print.) Jan., Feb., March, April, May, June, July, [Aug., 1916. (Jan., Feb., June, July, and [Aug. out of print.)
Glasgow & S.W.: Sept., Oct., 1916. (Sept. out of print).
North Eastern: Nov., Dec., 1916. Jan., Feb., March, April, May, 1917. (Nov. and Dec., 1916, and [Jan., 1917, out of print.)
South Eastern: June, July, Aug., 1917.
Lancashire and Yorkshire Railway: Sept., Oct., Nov., 1917.
London, Chatham and Dover Railway: Dec., 1917; Jan., Feb., 1918.
Caledonian Railway: March, April, May, June, 1918.

In January, 1919, Mr. Ahrons will commence a series dealing with the London, Brighton and South Coast Railway.

Digitized by Google

A Growing Business Needs Good Railway Transportation.

Build your New Works alongside the MIDLAND RAILWAY and so ensure reliable transportation

All the important towns, etc., shown below are directly served by the Midland Railway.

Bedford	Gloucester	Lincoln	Rotherham
Bradford	Heysham Harbour	Manchester	Sheffield
Burton-on-Trent	Kettering	Mansfield	Stroud
Birmingham	Luton	Market Harboro'	Swansea
Bristol	Leicester	Northampton	Wellingboro'
Bath	Loughborough	Nuneaton	Walsall
Chesterfield	Leeds	Nottingham	Wolverhampton
Derby	Liverpool	Newark	Worcester

Your works would thus be in direct communication with the principal centres of industry in Great Britain, as well as with the coalfields of Leicestershire, Warwickshire, Nottinghamshire, Derbyshire and Yorkshire; the ironstone mines of Northamptonshire and Nottinghamshire; and the numerous granite, limestone and freestone quarries throughout the system.

Interested enquirers will be supplied with full information on application to Mr. HENRY EVANS, CHIEF GOODS MANAGER, DERBY.

Derby. **W. GUY GRANET,** *General Manager.*

LANCASHIRE & YORKSHIRE RAILWAY.

SITES FOR WORKS.

COMMERCIAL MEN who are considering the ERECTION OF NEW FACTORIES and WORKS, or the EXPANSION OF EXISTING BUSINESSES, should take into account the following ADVANTAGES to be obtained in the Districts served by the LANCASHIRE & YORKSHIRE RAILWAY:—

There are a large number of ADMIRABLY SITUATED BUILDING SITES adjoining the Railway and on the Company's Wyre Dock Estate at the Port of Fleetwood.

COAL and RAW MATERIALS EASILY OBTAINABLE.

Proximity to the West and East Coast Ports means Favourable Conveyance Charges by Railway for Export and Import Traffic.

The Company will be pleased to help Manufacturers by advice in choosing Sites for the erection of Works, and to supply particulars of population, rates and taxes, power, and water, in the different districts through which the Railway runs.

Applications to be made to Mr. H. Shelmerdine, Land Agent, L. & Y. Railway, Manchester.

HUNT'S BANK, MANCHESTER. **JOHN A. F. ASPINALL, General Manager.**

Digitized by Google

BRITISH INDUSTRIES AND THE WAR.

MANUFACTURERS AND INVESTORS

contemplating the Establishment of New Industries as a result of the War, are invited to communicate WITH

THE CAMBRIAN RAILWAYS CO.

who have a large number of convenient and suitable

SITES FOR WORKS

to offer in the Counties of

SALOP, FLINT, DENBIGH, MONTGOMERY, RADNOR, BRECKNOCK, CARDIGAN, MERIONETH AND CARNARVON.

The Cambrian Railways system passes through some of the richest agricultural land in the country,

With an abundant Supply of Water for Generating Motive Power,

and has 60 miles of seaboard with excellent Harbour accommodation.
The district is admirably adapted for

Works, Factories, Warehouses, and other Industrial Undertakings.

The Company are prepared to assist in the establishment of such works by entering into arrangements for siding connections to be made with the railway, and will be pleased to obtain and furnish information as to suitable sites, siding facilities, rates for conveyance, etc.

Application should be made to—**S. WILLIAMSON,**
General Manager.

Oswestry, July, 1918.

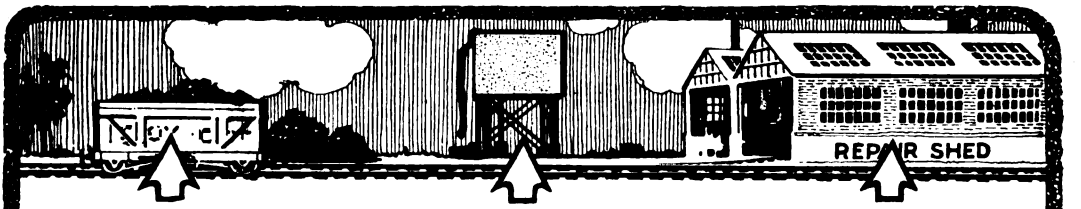
HURRY OFF, PLEASE

The train service cannot be hurried unless the passengers are hurried. Every unnecessary moment that a train stands at a platform means just as many moments delay to all the trains following it.

UNDERGROUND

Electric Railway House, Broadway, Westminster, S.W.1.

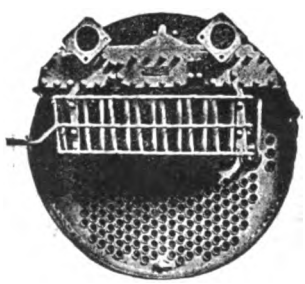
Digitized by Google



Save Coal. **Save Water.** **Save on Boiler Repairs.**

You save "all along the line"

if you equip your engines with the "Robinson" Superheater—the all-British Superheater which has proved its remarkable efficiency on over 60 railways throughout the world.



The

"Robinson"

LOCOMOTIVE

Superheater

will effect an all-round improvement in your locomotive service.

THE SUPERHEATER CORPORATION, Ltd.,
14, New Burlington Street, London, W. 1.

Digitized by Google

To Manufacturers, Merchants and Traders.

VARIOUS SITES

ADJOINING THE

RAILWAY

SUITABLE FOR THE

Erection of Works

ALSO

Warehouses and Factories

ARE NOW

AVAILABLE FOR LETTING.

Full particulars can be obtained on application to the

Estate Agent, S.E. & C.R., London Bridge Station; or Estate Dept., S.E. & C.R., Victoria Station.

FRANCIS H. DENT, General Manager.

FACTORY SITES.

THE MIDLAND AND SOUTH WESTERN JUNCTION RAILWAY connects the Midland system at Cheltenham, with the London and South Western Company at Andover, and runs through the Counties of GLOUCESTERSHIRE, WILTSHIRE and HAMPSHIRE. Suitable sites for Factories, Works, etc., adjoining the Railway are available, in respect to which full information will be given, upon application to

JOHN DAVIES,
Secretary & General Manager.

SWINDON, June, 1918.

THE

METROPOLITAN RAILWAY

Offers Unequalled Facilities

— for the erection of —

FACTORIES AND WAREHOUSES

WITHIN THE

Greater London Area.

It has Connections

— with all the —

MAIN TRUNK LINES

AND A

Goods Station in the City Area.

ELECTRIC POWER

Is Available and Cheap.

WORKMEN'S TICKETS

Are in force throughout

— the System. —

The Estate Agent at the Company's General Offices, Baker Street Station, N.W. 1, will gladly give information as to vacant sites, &c.

R. H. SELBIE,
GENERAL MANAGER.

Digitized by Google

SITES for WORKS, FACTORIES WAREHOUSES, etc. ADJOINING THE G·W·R·

Numerous areas of land, admirably situated.

Good Water Supplies. Proximity to Good Markets.

This **Railway** is connected with some of the largest **Steam, Anthracite** and **House Coal Fields,** many of the **Principal Ports,** and important and extensive **Iron** and **Steel-Producing Centres.**

Information as to **Suitable Sites, Siding Facilities, Conveyance Rates, etc.,** will be readily afforded on application to Mr. C. A. ROBERTS, Chief Goods Manager, Paddington Station, London, W. 2, to whom **Owners** and **Agents** of **Land** and **Premises** for **Sale** or to be **Let** are invited to send particulars for insertion in the **Register** which is kept to enable information to be furnished to parties requiring sites, etc.

G. W. Rly., Paddington Station, W. 2. **FRANK POTTER,** *General Manager.*

NORTH STAFFORDSHIRE RAILWAY.

SITES AND PREMISES

situated near to or adjoining the

NORTH STAFFORDSHIRE RAILWAY AND TRENT AND MERSEY CANAL SYSTEMS.

. . . SUITABLE FOR . . .

BRICKYARDS, FACTORIES,
CREAMERIES, FOUNDRIES,
STEEL & IRON WORKS, POTTERIES, etc.

With or without Siding Connections or Canal Wharves thereto.

NORTH STAFFORDSHIRE IS AN EXCELLENT DISTRICT FOR OBTAINING COAL, LIMESTONE AND OTHER RAW MATERIALS.

For Particulars, Maps, Plans, etc., apply to the

GENERAL MANAGER, NORTH STAFFORDSHIRE RAILWAY,

Telephone 701. **STOKE-ON-TRENT.** **Telegrams: "Phillipps," Stoke-on-Trent Station.**

Digitized by Google

GLASGOW AND SOUTH WESTERN RAILWAY.

Sites for Works, Factories, &c.

THERE are numerous available and suitable sites for Works, Factories, &c., adjoining the Glasgow and South Western system, which serves the whole of the Ayrshire coalfield and gives also direct connection with the Ports of Glasgow, Greenock, Ardrossan, Irvine, Troon, Ayr, and Stranraer.

Full information as to sites and rail, dock and siding facilities will be furnished on application to Mr. J. ROBINSON, Goods Manager, St. Enoch Station, Glasgow.

THE GLASGOW AND SOUTH WESTERN RAILWAY COMPANY have spacious and superior Fireproof Stores at their College Station, Glasgow, for the accommodation of Merchandise.

They also possess extensive Excise Bonded Warehouses at College (Glasgow) for the storage of Wines and Spirits.

The Bonded Warehouses are fitted up with special operating appliances for the superior and rapid execution of blending, racking, and bottling.

ST. ENOCH STATION, GLASGOW.
June, 1918.

DAVID COOPER, General Manager.

THE BUENOS AYRES WESTERN RAILWAY.

THE Buenos Ayres Western System contains the first section of railway built in Argentina—a section of about 16 miles having been open for traffic in 1857. In its present form the Company dates back to 1890, and has since then added 1,000 miles to its length and brought its property up to a position second to none in the Argentine. The suburban lines are being electrified and direct communication with the docks secured by a tunnel under the City of Buenos Ayres, which will also be worked electrically.

The present paid up capital is £30,072,203, with 1,882 miles opened for traffic.

LONDON OFFICES—

River Plate House, 10 & 11, Finsbury Circus, London, E.C. 2.

Digitized by Google

SITES
FOR NEW FACTORIES
WORKS OR WAREHOUSES
Have you considered the district served by the Brighton Railway?
WRITE STATING YOUR REQUIREMENTS TO
Publicity Dept, L.B.&S.C.Rly., London Bridge Terminus
WILLIAM FORBES, General Manager.

G. E. R.

EAST ANGLIA

is worth consideration in connection with all business development schemes.

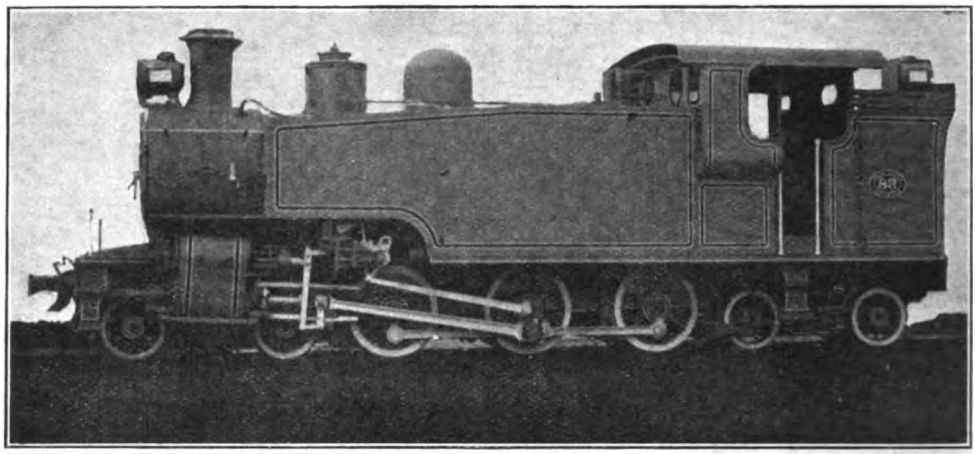
If you are extending or building new works, factories or warehouses, you may find just the site you want in

EAST ANGLIA.

——Full information and all possible assistance will be readily afforded upon application to——

S. A. PARNWELL, Land Agent (Dept. B.D.), Liverpool Street Station, London, E.C. 2.

Digitized by Google



THE HUNSLET ENGINE CO., LTD.,
LEEDS, ENGLAND.

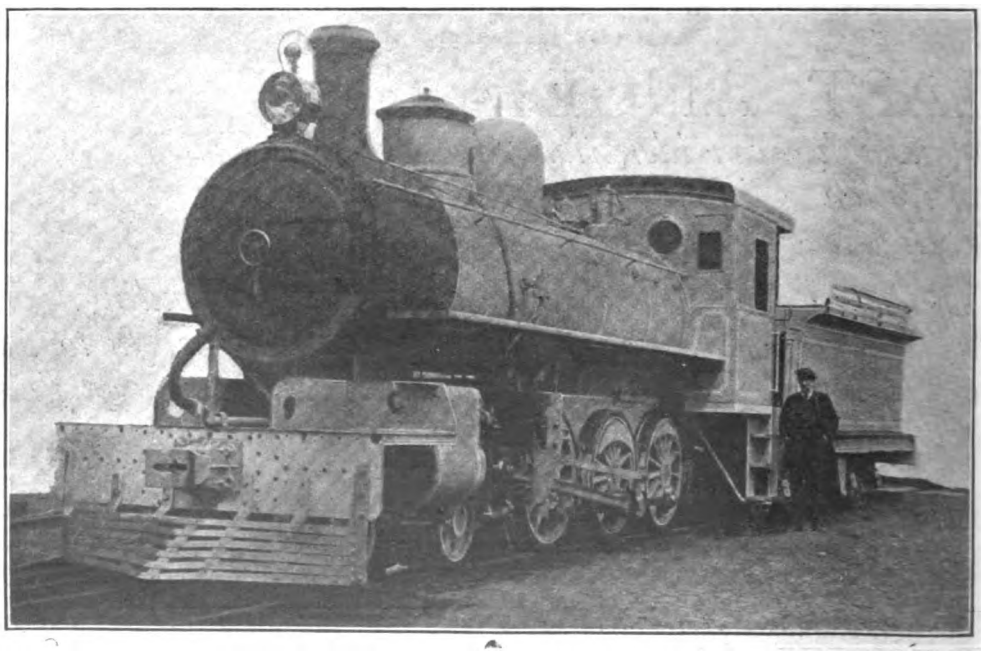
Designers and Builders of

LOCOMOTIVES

For any GAUGE, CLIMATE or SERVICE.

Telephone: 20877 (3 lines). Telegrams: "ENGINE, LEEDS."

London Office: 1, BROAD STREET PLACE, E.C. 2.



Digitized by Google

THE -PROVED- -BEST-

NAPIER

·BRITISH· ·BUILT·

SIX-CYLINDER MOTOR CARRIAGE

SIMILITUDE ÷REFINEMENT÷ -SILENT POWER.- & STABILITY.

D·NAPIER & SON, LTD.,

WORKS, ACTON, LONDON, W.

14, New Burlington Street, LONDON, W.

Digitized by Google

British Trade Expansion.

THE L. & N.W. Railway Company beg to call attention to the numerous sites adjacent to the railway system which are suitable for the erection of Works or Factories of every description.

The L. & N.W. Railway Company serve or are in communication with all the large Manufacturing Towns, Ports, and Coal Centres of the United Kingdom, and afford facilities for the transmission of merchandise. Manufacturers and others who are seeking sites for the development of Trade should communicate with

THE CHIEF GOODS MANAGER, EUSTON STATION, LONDON, N.W. 1,

who will be happy to supply plans and full information regarding available land and vacant premises, together with siding possibilities, cost of electricity, gas, water, local conditions, &c., &c.

I. T. WILLIAMS,
Acting General Manager.

L. & N.W. Railway,
Euston Station, N.W. 1.

L. & N. W. R.

The following HOTELS are under the Company's Management.

LONDON (Euston).... Tel. No.: Museum 3000.	**EUSTON HOTEL.** Telegraphic Address: "Bestotel, Eusquare, London."
BIRMINGHAM (New Street Station) Tel. No.: Midland 2740 (10 lines).	**QUEEN'S HOTEL,** Telegraphic Address: "Bestotel, Birmingham."
LIVERPOOL (Lime Street) Tel. No.: Royal 7900.	**NORTH WESTERN HOTEL.** Telegraphic Address: "Bestotel, Liverpool."
BLETCHLEY	**STATION HOTEL.** Telegraphic Address: "Bestotel, Bletchley."
CREWE Tel. No.: 21.	**CREWE ARMS HOTEL.** Telegraphic Address: "Bestotel, Crewe."
HOLYHEAD Tel. No.: 24.	**STATION HOTEL.** Telegraphic Address: "Bestotel, Holyhead."
GREENORE	**GREENORE HOTEL.** Telegraphic Address: "Bestotel, Greenore."
PRESTON Tel. No.: 188.	**PARK HOTEL.** Telegraphic Address: "Bestotel, Preston."
DUBLIN (North Wall) Tel. No.: 1291.	**NORTH WESTERN HOTEL.** Telegraphic Address: "North Western Hotel, Dublin."

Hotel Porters in Red Coats meet the Trains and Boats and convey visitors' luggage free to and from the Hotel.

EUSTON STATION,
LONDON, N.W.

I. T. WILLIAMS,
Acting General Manager.

Digitized by Google

THE RAILWAY MAGAZINE.

Contents for July, 1918.

		PAGE
COLOUR PLATE—Great Western Railway, 2-6-0 locomotive, No. 4331	*Facing*	1
GREAT NORTHERN ROUTE TO CAMBRIDGE. *Illustrated*...	H. L. HOPWOOD	1
NAPIER MOTOR LORRY IN WAR SERVICE. *Illustrated*		8
LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY. Great Eastern Railway [No. 1]	E. L. AHRONS	9
A TANK ON TOUR. *Illustrated*		16
BRITISH LOCOMOTIVE PRACTICE AND PERFORMANCE. *Illustrated*	CECIL J. ALLEN	17
A WONDERFUL RAILWAY RACE	JNO. ORR	30
KING'S BIRTHDAY HONOUR FOR L. & N.W. RAILWAY GENERAL MANAGER. Sir Guy Calthrop, Bart., Controller of Coal Mines. *With Portrait*		33
RAILWAY MEN'S FLAG DAY. *Illustrated*		34
GOVERNMENT CONTROL OF RAILWAYS IN WAR TIME. [No. I.—The United States].	VERNON SUMMERFIELD	35
BARRY RAILWAY: ITS GROWTH AND ENTERPRISE. *Illustrated*		38
UNITED STATES AMBULANCE TRAIN, No. 62. Built by the London & South Western Railway. *Illustrated* ...		41
GREAT NORTHERN RAILWAY: NEW THREE-CYLINDER COAL ENGINE. *Illustrated*		43
THE WHY AND THE WHEREFORE		46
UNITED STATES AMBULANCE TRAIN No. 65. Constructed at Wolverton by the London and North Western Railway. *Illustrated*		51
LONDON AND NORTH WESTERN RAILWAY: CHILDREN'S DAY AT WEMBLEY. *Illustrated*		52
PERTINENT PARAGRAPHS. *Illustrated*		53
WHAT RAILWAYS ARE DOING. *Illustrated*		64

Annual Subscription (United Kingdom or Abroad), post free, 13s. 6d. Single copies or back numbers (if in print), by post, 1s. 2d.

Registered at the General Post Office for transmission by Magazine Post to Canada and Newfoundland.

All articles and illustrations submitted must be accompanied by a stamped and addressed envelope, for return in case of non-acceptance.

(ALL RIGHTS RESERVED.)

Editorial, Advertisement, and Publishing Offices: 30, FETTER LANE, FLEET STREET, LONDON, E.C. 4.
TELEPHONE: HOLBORN 2087.

L.S.W.R.

British Trade Expansion

TO MANUFACTURERS & TRADERS

Particulars of Sites suitable for Factories and Works can be obtained on application to

THE PUBLICITY DEPARTMENT,
. . . L. & S. W. RLY., . . .
WATERLOO STATION, S.E.

LAND OWNERS & ESTATE AGENTS

with Properties for Sale in the vicinity of the London & South Western Railway, are also invited to communicate with the above Department.

H. A. WALKER, General Manager.

Digitized by Google

MIDLAND GREAT WESTERN RAILWAY.

MALLARANNY HOTEL (Achill)

ON SEA COAST.

RECESS HOTEL (Connemara),

GOOD SALMON AND TROUT FISHING.

Apply to SECRETARY, BROADSTONE STATION, DUBLIN.

BELFAST & COUNTY DOWN RAILWAY.

TOURIST DISTRICT.

To Tourists, Golfers, Antiquarians and Health Seekers.

The District served by the BELFAST AND COUNTY DOWN RAILWAY comprises: PORTAFERRY and STRANGFORD LOUGH, ARDGLASS and KILLOUGH, BANGOR and DONAGHADEE, BALLYNAHINCH and its SPA, NEWCASTLE, BRYANSFORD, ROSTREVOR, and the justly celebrated MOURNE MOUNTAINS.

DIRECT ROUTE to NEWCASTLE, County Down, "The Queen of Irish Watering Places," is from QUEEN'S QUAY STATION, BELFAST.

Punctual and expeditious Train Service. EXPRESS TRAINS perform the journey in **55** MINUTES.

SLIEVE DONARD HOTEL, NEWCASTLE, CO. DOWN. Owned and managed by the Belfast and County Down Railway Company, beautifully situated on the shores of Dundrum Bay, at the foot of the famous Mourne Mountains.

The Revised Edition of Official Guide to County Down and the Mourne Mountains may be had on application to the undersigned. Copies **1**/- each, post free.

Queen's Quay Terminus, Belfast,
June, 1918.

CHARLES A. MOORE,
General Manager.

B.S.A

MOTOR BICYCLES

For Solo and Sidecar.

THE simplicity of the B.S.A. Motor Bicycle renders it exceptionally easy to drive and control. It provides ample power for solo and sidecar work, and brilliant successes achieved at the Front are eloquent testimony to the quality and endurance of B.S.A. material and workmanship.

New Catalogue Free.

THE BIRMINGHAM SMALL ARMS COMPANY, LIMITED,
Small Heath,
BIRMINGHAM.

To face first text.

Digitized by Google

NAPIER

THE PROVED BEST

MOTOR CARRIAGES

·BRITISH BUILT·

Please write for Particulars and Join our waiting List.

D·NAPIER & SON, LTD.

Contractors to the BRITISH, FRENCH, ·AND· ALLIED GOVERNMENTS.

WORKS, ACTON, LONDON, W.

14 New Burlington Street LONDON, W.

To face last text.

Digitized by Google

JOSEPH KAYE & SONS, Ltd.

Governing Director: W. K. KAYE, M.I.Mech.E.

MAKERS OF PATENT AUTOMATIC CARRIAGE DOOR LOCK, HANDLES AND SAFETY CATCH.

ADOPTED BY THE FOLLOWING RAILWAYS:

North Eastern Railway,
Great Northern Railway,
London & South Western Railway.
London, Brighton & South Coast Railway,
Lancashire & Yorkshire Railway,
South Eastern & Chatham Railway.
Great Eastern Railway,
Great Central Railway, etc., etc.

Railway Engineers and Carriage Superintendents are invited to visit our Showrooms at

93, HIGH HOLBORN, LONDON, W.C. Works: Hunslet, Leeds.

THE RAILWAY CLUB.

Founded in 1899 for the purpose of bringing together those who are interested in railways. Extensive library at London headquarters. Periodical meetings and outings.

COMING EVENTS:

JULY 20.—Sykes Interlocking Signal Works, Clapham. Meet at Clapham Road Station (C. & S. L.), 2.30 p.m.

AUG. 17.—Country Ramble to Potters Bar. Meet at 2 p.m. at King's Cross Local Booking Office, for 2.30 p.m. train.

For full particulars write, enclosing 1½d. stamp, to—

Mr. E. J. MILLER, Hon. Sec.,
92, VICTORIA STREET, LONDON, S.W. 1.

MODELS
RAILWAYS AND LOCOS.

The only journal devoted Solely to the construction of working Models.

Edited by H. GREENLY.

PUBLISHED MONTHLY. Price **6d.**

Specimen Copy 7d., post free.

MODEL ENGINEERING PRESS,
37 & 38, STRAND.

THE FIRST RAILWAY IN LONDON.

By A. R. BENNETT, M.I.E.E., M.I.Loco.E.

The chequered story of the LONDON and GREENWICH Railway from 1832 to 1878, its engineering features, locomotive history, business aspirations, struggles and fortunes in full detail. Coloured frontispiece of Sharp Robert's Engine of 1844, and 45 other illustrations.

Price 3s 6d.; by Post 3s. 9d.

THE RAILWAY PUBLISHING COMPANY, LTD.,
3, Tetter Lane, Fleet Street, London, E.C. 4

DON'T FORGET
YOUR FRIEND
IN THE FORCES.
SEND HIM A
RAILWAY MAGAZINE.

89-90, SHOE LANE, LONDON, E.C.

SWAINS' BLOCKS FOR ILLUSTRATING.

JOHN SWAIN & SON Ltd

PHOTO-ENGRAVERS & ART REPRODUCERS BY ALL PROCESSES.

and at HIGH BARNET, GLASGOW, MANCHESTER, BRISTOL & PARIS.
Telephone — 0833 HOLBORN

Digitized by Google

Price 3s. net, Cloth Bound. *Third Impression Now Ready.*

The Fixing of Rates and Fares.

By H. MARRIOTT,

Chief Goods Manager, Lancashire and Yorkshire Railway.

WITH AN INTRODUCTION BY

Prof. S. J. CHAPMAN, M.A.,

Dean of the Faculty of Commerce of the Victoria University of Manchester.

In this small volume, illustrated by numerous tables and diagrams, Mr. Marriott, an experienced railway officer, explains in simple language the whole system on which British railway rates and fares are arranged. The information in this book was originally given in a series of lectures to railway students at the Victoria University of Manchester, and as now published for the first time in book form will be of great value as a text book for railway students, railway clerks, traders, economists, politicians, and the travelling public.

PUBLISHED BY

"THE RAILWAY GAZETTE,"

Queen Anne's Chambers, Westminster, London, S.W. 1.

Now on Sale. **Twenty-first Year of Publication.**

Railway Year Book

1918.

THE WHITAKER OF THE RAILWAY WORLD.

Handsomely Bound in Red Cloth. Contains 38 Maps. Price **5s.** net. By Post in the United Kingdom **5s. 6d.** Abroad **5s. 7d.**

MOST COMPLETE RAILWAY REFERENCE BOOK. UP-TO-DATE AND RELIABLE.

A complete *vade mecum* for Railway Officers, Railway Shareholders, Contractors, Engineers and Manufacturers of Railway Materials and Supplies.

Directory of Railway Directors, Officers, District Agents, &c. :: ::
Directory of Railway Engineers and Stores Superintendents. :: ::
Railway Telegraphic Addresses and Telephone Numbers. :: ::
Historical Sketches of principal Railways in United Kingdom. :: ::
Railway Miscellany; Speed Tables for Timing Trains; Longest Tunnels; Notable Accidents; Power Signalling; Largest Railway Stations, &c. :: :: :: :: :: :: :: ::
Electrical Railways; Joint Railways; Leased Railways. :: :: ::
British Railways and the Great War; Railwaymen with the Colours.
Railway Societies, Associations, Institutions and Clubs. :: :: ::
Statistics of Capital, Receipts, Expenditure, Dividends, Rolling Stock, Railway Engineering Facts and Figures, Railway Officer's "Who's Who," and many other valuable features. :: :: ::

THE RAILWAY PUBLISHING CO., LTD.,

30, Fetter Lane, Fleet Street, London, E.C. 4.

Digitized by Google

The Railway Magazine.

ESTABLISHED July, 1897. Published Monthly. Price 1s. net. By Post, 1s. 2d. Annual Subscription to all parts (including postage), 13s. 6d., payable in advance.

Railway Year Book.

TWENTY-FIRST Annual Edition (1918). Contains 38 maps. The recognised standard railway reference work Price 5s. By post, 5s. 6d. Abroad, 5s. 7d.

Locomotive Shed Notes.

RECENT publication. Illustrated. Useful to Locomotive Fireman and Fitters. Should be studied by all who desire new knowledge of the steam locomotive. Price 2s. 6d. net. By post, 2s. 9d.

Lectures on the Working of Locomotive Engines.

BY D. Drummond, M.I.C.E. New Edition. Sold for benefit of London and South Western Railway Servants' Orphanage. 202 pages, well illustrated. Price 1s. 6d. net. By post, 1s. 9d.

G.W.R. Engine Book.

CONTAINS locomotive illustrations; List of all G.W.R. Engine numbers and names; Chapter on naming of Locomotives, etc., etc. A book that should be possessed by every one interested in G.W.R. Locomotives. Price 1s. net. By post, 1s. 1½d.

Two Books on Railway Operation.

(1) THE PASSENGER STATION AND SIGNALLING.
(2) THE GOODS DEPOT.

BY Jenkinson, Lamb, and Travis. Price 1s. net each. By post, 1s. 2d. each; 2s. 4d. the two. (1) Eleven chapters describing the working and management of the Passenger Station, and the theory and working of Signals; 35 illustrations. (2) Nine chapters on Goods Traffic and Station Work; 25 illustrations.

Historic Locomotives.

and "Moving Accidents" by Steam and Rail. By Alfred Rosling Bennett, M.I.E.E. A fascinating book containing ten splendid colour plates of railway engines. Soon will be out of print. Price 2s. 6d. By post, 2s. 9d.

Development of British Locomotive Design.

BY E. L. Ahrons. Contains 230 profusely illustrated pages and four large Working Drawings. Price 5s. By post, 5s. 6d.

First Railway in London.

BY A. R. Bennett. The chequered story of the London and Greenwich Railway from 1832 to 1878. Coloured frontispiece of Sharp Roberts' Engine of 1844 and 45 other illustrations. A mine of information attractively presented and illustrated admirably. Price 3s. 6d. By post, 3s. 9d.

Large Colour Plates of Locomotive Engines.

Two Colour Plates of British Locomotives:—Great Northern, No. 1452, and London and South Western, No. 443. Size of each plate, 20 by 12 inches. Magnificent pictures for framing. Full particulars of dimensions. Price 4d. each. By post, 5d. each.

Small Engine Plates.

HIGHLAND No. 73, North Staffordshire No. 114, Midland Railway (Northern Counties Committee) No. 70, Great Northern Railway No. 1636, M.G.W.R. No. 6, *Kylemore*, Great Western No. 4041, Great Western No. 4331, and North British No. 411. Size 10¾ × 6¾ in. Price 2d. each. By post, 3d. for one, or 1s. 5d. for eight.

Colour Train Plates.

GREAT Western Railway Irish Boat Express; Great Eastern Railway Restaurant Car Train; London and South Western Railway North Cornwall Express. Size of each plate, 9½ × 19½ inches. Unfolded copies of these beautiful plates, 4d. each. By post, 5d. each.

Small Train Plates.

FOUR Colour Plates of British Railway Trains: - Great Eastern Train near Audley End; London and North Western Glasgow—London Express; London and North Western, Liverpool and Manchester to Glasgow Express passing Tebay; North Eastern Train on Furness Railway. Size 10¾ × 6¾ inches. Price 2d. each. By post, 3d. for one, 5d. for two, 7d. for three, 9d. for four.

Double-tone Engine Plates.

FIVE fine double-tone plates:—L. & N.W 4-cylinder Superheater No. 2204, *Sir Herbert Walker, K.C.B.*; S.E. & C.R. new 2-6-0 superheater goods No. 810; G.N.R. 2-6-0, No. 1640; G.C.R. No. 1169, *Lord Farringdon*; S.E. & C.R. 2-6-4 Type Tank locomotive No. 790. Each plate 10 by 12 ins. Unfolded Copies 3d. each. By post, 4d. each.

Bound Volumes.

"RAILWAY MAGAZINE." Half-yearly Vols. 32, 34, 39, 41 and 42. Strongly bound in red cloth, gold lettered covers. Price 9s. each. By inland post, 9s. 6d.; abroad, 10s. 0d. Several of these Vols. are nearly out of print.

Binding Covers.

RED cloth, gold lettered binding cases for "Railway Magazine," each to bind six parts, Vols. I. to XLII. Price 2s. each. Postage for one case, 3d. If more than one is ordered at one time, add 1d. postage for each cover after the first.

Binding.

HALF-YEARLY Volumes of "Railway Magazines" are bound on following terms. Send the Parts securely packed in Carriage Paid parcels, and they will be returned beautifully bound, in red cloth, gold lettered cases, post free in the United Kingdom, 4s. 6d. for one; 8s. 8d. for two; and 12s. 10d. for three Volumes. Remittance with order.

THE RAILWAY PUBLISHING CO., LTD

30, Fetter Lane, Fleet Street, London, E.C. 4.

JULY, 1918. **Telephone: HOLBORN 2087.**

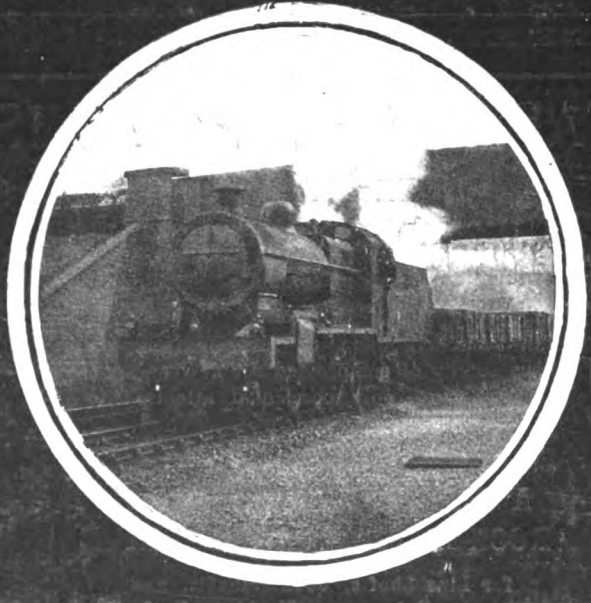
Digitized by Google

FLEXIBLE METALLIC TUBING
For Loco Feed Water Pipes. Thousands in Use.
Indestructible by Oil, Heat or Dirt.

THE JOHN CRERAR LIBRARY
AUG 15 1918

THE Railway Magazine.

1/- NET



JULY, 1918.
No. 253. Vol. XLIII.

This Number Contains Colour Plate of a G.W.R. Express.

THE UNITED FLEXIBLE METALLIC TUBING CO., Ltd.
Registered Offices: 112, QUEEN VICTORIA STREET, LONDON.
Works: PONDERS END, MIDDLESEX.

Digitized by Google

Trade after the War

If you contemplate erecting a

NEW WORKS *or* FACTORY

in an ideal position with the advantage of

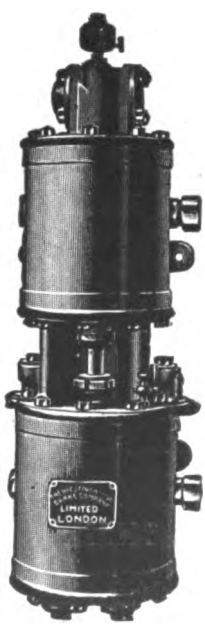
CHEAP POWER
GOOD WATER SUPPLY
HEALTHY SURROUNDINGS

SIDING ACCOMMODATION
EFFICIENT TRANSPORT FACILITIES

Write Great Central Railway Publicity Office, 216, Marylebone Road, London, N.W. 1, stating your requirements.

SAM FAY, *General Manager.*

PROFITABLE "SHOP" ASSISTANTS



A WESTINGHOUSE STANDARD AIR COMPRESSOR

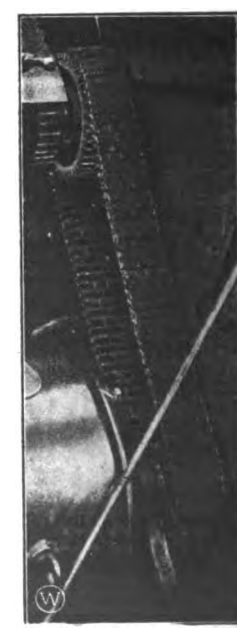
hung on a wall or column or "tucked away" in a corner, near the boiler,

can be relied upon to furnish a continuous supply of compressed air at very small cost, and with only occasional attention to lubrication.

A WESTINGHOUSE-MORSE 'ROCKER-JOINT' CHAIN DRIVE

for Line Shafts, Countershafts, and Direct Drives to Machine Tools,

enables the transmission of practically the full power of the prime mover to its objective, due to the elimination of sliding friction at the joint when under load.



MANUFACTURED IN LONDON BY

THE WESTINGHOUSE BRAKE CO., LTD., KING'S CROSS, N.1.

Digitized by Google

Brecon and Merthyr Railway (Illustrated).
London Brighton & South Coast Railway Early History. Etc., etc.

THE Railway Magazine

1/- NET

No. 254. AUGUST, 1918. Vol. XLIII.

Digitized by Google

Trade after the War

If you contemplate erecting a

NEW WORKS *or* FACTORY

in an ideal position with the advantage of

CHEAP POWER
GOOD WATER SUPPLY
HEALTHY SURROUNDINGS

SIDING ACCOMMODATION
EFFICIENT TRANSPORT FACILITIES

Write Great Central Railway Publicity Office, 216, Marylebone Road, London, N.W. 1, stating your requirements.

SAM FAY, *General Manager.*

Gold Medal Franco-British Exhibition, 1908.

DECOLITE

COMPOSITION (FIRE-RESISTING) FLOORING
for
Flooring of RAILWAY COACHES, Electric Stock, Mail Vans, Kitchen Cars, Lavatories, etc., etc., also for Offices, Factories, Warehouses, Hospitals, etc.

DECOLITE is Hygienic, Tough and Hard-wearing, Warm and Elastic to the Tread. Fire-resisting, Vermin Proof, Damp Proof. For New Buildings, etc., also for overlaying existing Wooden, Stone, Cement or Steel Floors.

"Salamander" Asbestos Millboard

FIRE-PROOF. EXCELLENT NON-CONDUCTOR.

BELLS UNITED ASBESTOS Co., Ltd.,

SOUTHWARK STREET, LONDON.

Digitized by Google

Frontispiece: Historic L.&N.W.R. Locomotive "Cornwall."
Some South Devon Gradients. Etc., Etc.

THE Railway Magazine

1/- NET

SEPTEMBER, 1918.
No. 255. Vol. XLIII.

Digitized by Google

Trade after the War

If you contemplate erecting a

NEW WORKS *or* FACTORY

in an ideal position with the advantage of

CHEAP POWER
GOOD WATER SUPPLY
HEALTHY SURROUNDINGS

SIDING ACCOMMODATION
EFFICIENT TRANSPORT FACILITIES

Write Great Central Railway Publicity Office, 216, Marylebone Road, London, N.W. 1, stating your requirements.

SAM FAY, *General Manager.*

POWER SIGNALLING

Electro-Pneumatic.
(Westinghouse)

All Electric.
(McKenzie & Holland)

Automatic and Interlocking Signalling Systems.

A-C or D-C Systems of Track Circuiting.

THE McKENZIE, HOLLAND, & WESTINGHOUSE POWER SIGNAL CO. LTD.
58, VICTORIA STREET, LONDON, S.W. 1.
Telegrams:—"Powersig, Sowest, London." *Telephone:* 4760 Victoria (2 lines).

Digitized by Google

Frontispiece : N.E.R. Luncheon Car Express.

C. J. Allen's One-hundreth illustrated article on British Locomotive Practice and Performance.

THE JOHN CRERAR

THE Railway Magazine

1/- NET

No. 256. OCTOBER, 1918. Vol. XLIII.

Digitized by Google

Trade after the War

If you contemplate erecting a

NEW WORKS *or* FACTORY

in an ideal position with the advantage of

CHEAP POWER
GOOD WATER SUPPLY
HEALTHY SURROUNDINGS

SIDING ACCOMMODATION
EFFICIENT TRANSPORT FACILITIES

Write Great Central Railway Publicity Office, 216, Marylebone Road, London, N.W. 1, stating your requirements.

SAM FAY, *General Manager.*

Gold Medal Franco-British Exhibition, 1908.

DECOLITE

COMPOSITION (FIRE-RESISTING) FLOORING

for

Flooring of RAILWAY COACHES, Electric Stock, Mail Vans, Kitchen Cars, Lavatories, etc., etc., also for Offices, Factories, Warehouses, Hospitals, etc.

DECOLITE is Hygienic, Tough and Hard-wearing, Warm and Elastic to the Tread. Fire-resisting, Vermin Proof, Damp Proof. For New Buildings, etc., also for overlaying existing Wooden, Stone, Cement or Steel Floors.

"Salamander" Asbestos Millboard

FIRE-PROOF. EXCELLENT NON-CONDUCTOR.

BELLS UNITED ASBESTOS Co., Ltd.,

SOUTHWARK STREET, LONDON.

Digitized by Google

Frontispiece: Caledonian Railway 0-6-0 Locomotive.
Narrow Gauge and Light Railway Development.
The Principles of Freight Train Operating.

NOV 30 18

THE Railway Magazine

1/- NET

NOVEMBER, 1918.
No. 257. Vol. XLIII.

Digitized by Google

Trade after the War

If you contemplate erecting a

NEW WORKS *or* FACTORY

in an ideal position with the advantage of

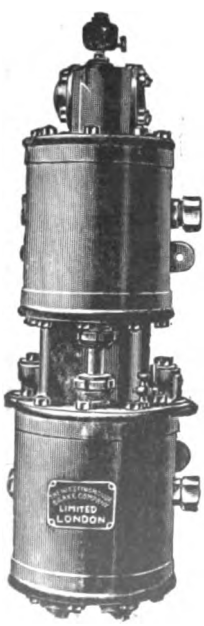
CHEAP POWER
GOOD WATER SUPPLY
HEALTHY SURROUNDINGS

SIDING ACCOMMODATION
EFFICIENT TRANSPORT FACILITIES

Write Great Central Railway Publicity Office, 216, Marylebone Road, London, N.W. 1, stating your requirements.

SAM FAY, *General Manager.*

PROFITABLE "SHOP" ASSISTANTS



A WESTINGHOUSE STANDARD AIR COMPRESSOR

hung on a wall or column or "tucked away" in a corner, near the boiler,

can be relied upon to furnish a continuous supply of compressed air at very small cost, and with only occasional attention to lubrication.

A WESTINGHOUSE-MORSE 'ROCKER-JOINT' CHAIN DRIVE

for Line Shafts, Countershafts, and Direct Drives to Machine Tools,

enables the transmission of practically the full power of the prime mover to its objective, due to the elimination of sliding friction at the joint when under load.

MANUFACTURED IN LONDON BY

THE WESTINGHOUSE BRAKE CO., LTD., KING'S CROSS, N.1.

Digitized by Google

Automatic Continuous Brakes on Railways.
The Mawddwy Railway.
East to West via Switzerland.

THE JOHN CRERAR
JAN 3 1919

THE Railway Magazine

1/- NET

No. 258. DECEMBER, 1918. Vol. XLIII

Digitized by Google

Trade after the War

If you contemplate erecting a

NEW WORKS *or* FACTORY

in an ideal position with the advantage of

CHEAP POWER
GOOD WATER SUPPLY
HEALTHY SURROUNDINGS

SIDING ACCOMMODATION
EFFICIENT TRANSPORT FACILITIES

Write Great Central Railway Publicity Office, 216, Marylebone Road, London, N.W. 1, stating your requirements.

SAM FAY, *General Manager.*

Gold Medal Franco-British Exhibition, 1908.

DECOLITE

COMPOSITION (FIRE-RESISTING) FLOORING

for

Flooring of RAILWAY COACHES, Electric Stock, Mail Vans, Kitchen Cars, Lavatories, etc., etc., also for Offices, Factories, Warehouses, Hospitals, etc.

DECOLITE is Hygienic, Tough and Hard-wearing, Warm and Elastic to the Tread. Fire-resisting, Vermin Proof, Damp Proof. For New Buildings, etc., also for overlaying existing Wooden, Stone, Cement or Steel Floors.

"Salamander" H.C. Millboard

FOR CEILINGS OF ELECTRIC AND OTHER COACHES.

BELLS UNITED ASBESTOS Co., Ltd.,

SOUTHWARK STREET, LONDON.

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

UNIVERSITY OF CHICAGO
65 453 274

Digitized by Google